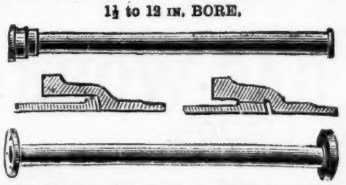
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1474.] LONDON, AUGUST 11, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

1½ to 12 IN. BORE.



THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
23, GREAT GEORGE ST., WESTMINSTER, S.W.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

PURIMACHOS GAS CEMENT

Capable of withstanding Greater Heat than that adequate to the Fusion of Iron.

Supplied to Her Majesty The Queen; to His Royal Highness The Prince of Wales; and to Her Majesty's Government; to Foreign Governments; and to public and private Gas-Works, &c., in GREAT BRITAIN and IRELAND, in ALL THE COLONIES, and in EVERY OTHER PART OF THE WORLD where Gas is used.

PURIMACHOS is regularly and increasingly used in GAS-WORKS at home and abroad, and has received the special commendation of the most distinguished Engineers and Managers, as invaluable for promptly and economically building, glazing, repairing, and consolidating RETORTS and FURNACES (in and out of action), PIPES, and ALL OTHER ERECTIONS (of Clay, Brick, or Iron) where FIRE or HEAT is employed—the action of which it will effectually resist.

The Highest Testimonials and References from Eminent Authorities, at home and abroad, in support of the foregoing statements.

Registered Telegraphic Address: "PURIMACHOS, BRISTOL." | Prices and further particulars on application to THE MANAGER, BRISTOL PURIMACHOS WORKS, REDLAND, BRISTOL.

THE COST OF PURIFICATION REDUCED
to a minimum by
C. & W. WALKER'S
PATENT PURIFYING MACHINE,
Which has now fully proved itself to be the most effectual, powerful, and perfect Apparatus in the World,
FOR PURIFYING GAS FROM
TAR, CARBONIC ACID, AMMONIA,
and a large portion of
SULPHURETTED HYDROGEN,
Doing all the work of Purification between the Condensers and Purifiers, and relieving them of much work.
Its cost is less than any other known Apparatus for purifying Gas from Tar and Ammonia.

Testimonials, Drawings, and Prices on Application.

8, Finsbury Circus, London, E.C.; Midland Iron-Works, Donnington, near Newport, Shropshire.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

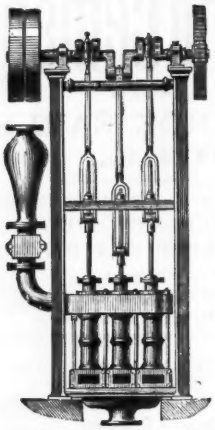
AND

IMPROVED DRY GAS-METERS;

Also Sole Makers of THORP AND MARSH'S PATENT CASH PREPAYMENT ATTACHMENT FOR GAS-METERS.

STEAM & HAND PUMPS FOR GAS-WORKS,

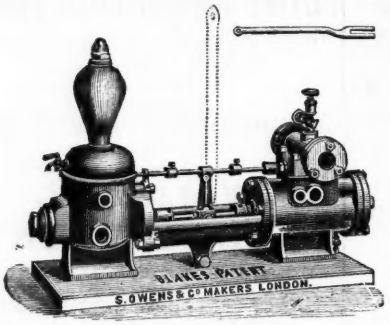
FOR PUMPING TAR, WATER, AND LIQUOR.



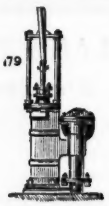
Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S
PATENT
STEAM PUMPS.
20,000 IN USE.



Improved Double Action Pump.

Cast-Iron Hand-Pump.

Wrought-Iron Portable Pump.

S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

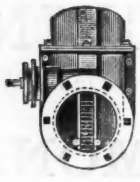
MANUFACTURERS OF

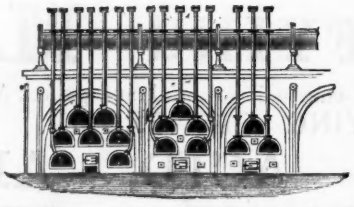
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.

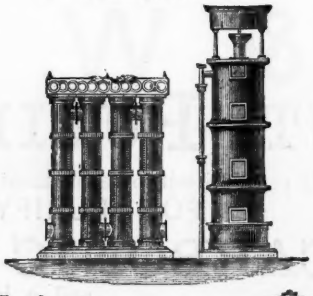
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

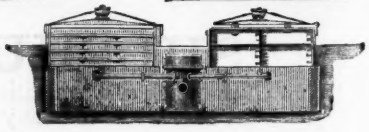
WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.









PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

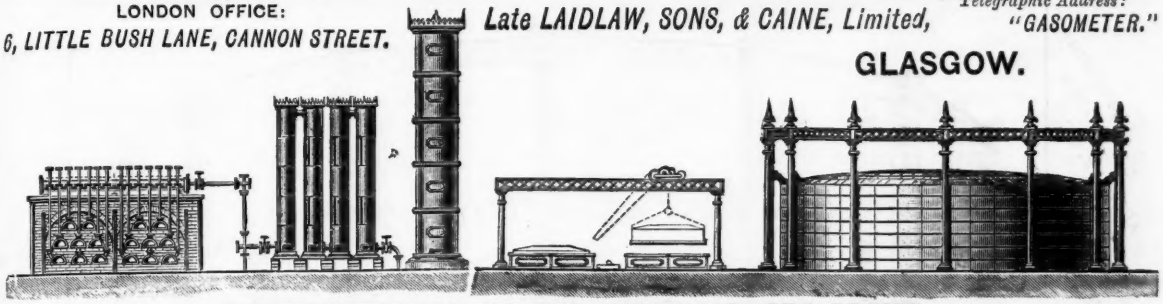
THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,

Telegraphic Address:
"GASOMETER."

GLASGOW.



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

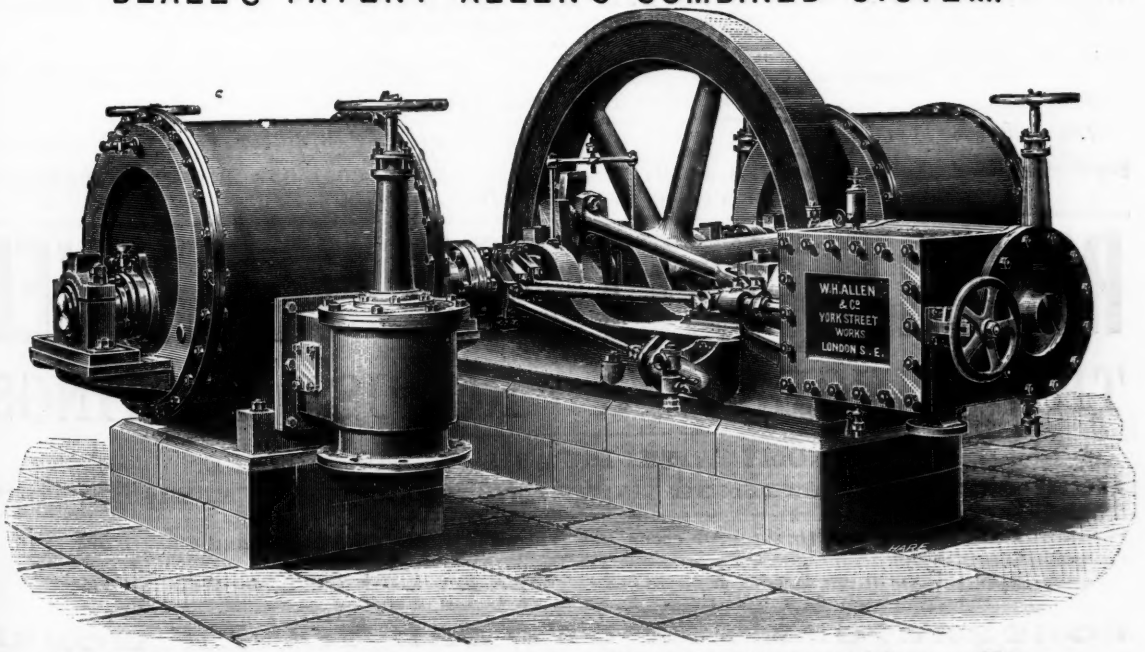
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

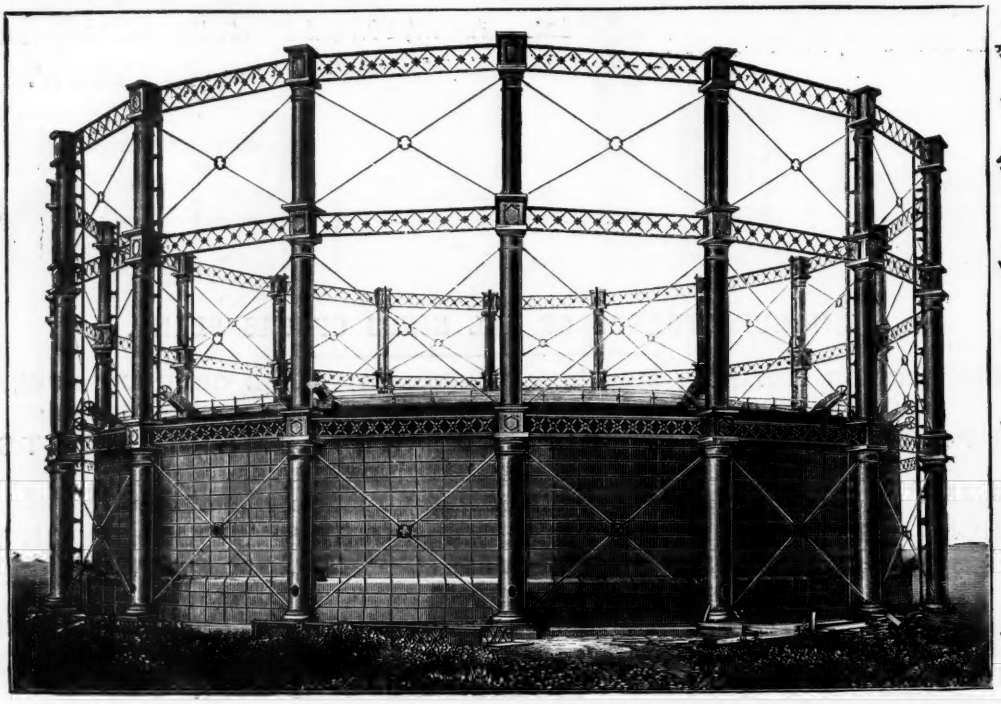


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED FOUL PIPES, MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

AUTOMATIC SYSTEM OF CHARGING AND DRAWING

INCLINED GAS-RETORTS.

Gold Medal, Paris Exhibition, 1889.

By this process there is obtained—

1. A SAVING OF **70** PER CENT. IN THE CARBONIZING OF COAL.
2. AN AVERAGE SAVING OF **2s. 3d.** PER TON ON ALL COAL CARBONIZED.

Which represents a saving of **One Million Sterling** per Annum to Gas Companies in the United Kingdom alone.

This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.

For Illustrated Description, see Advt. p. 229.

THE PROCESS IS FULLY PATENTED, AND ANY INFRINGER WILL BE STRICTLY PROCEEDED AGAINST.

For further particulars apply to W. M. KIGHT, Secretary, AUTOMATIC COAL-GAS RETORT COMPANY, LTD., 86 and 88A, LEADENHALL STREET, LONDON, E.C.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,

20, BUCKLERSBURY, LONDON, E.C.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N.
GOODS YARD, KING'S CROSS, N.

LIVERPOOL:
16, Lightbody Street.

LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

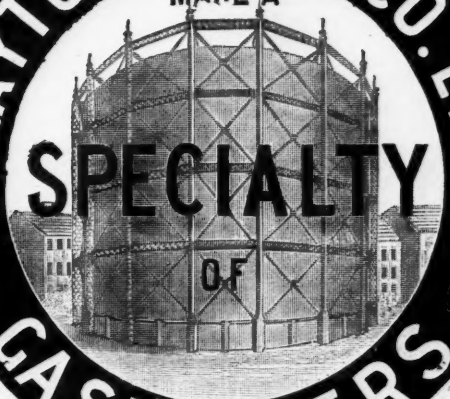
ESTABLISHED MORE THAN A QUARTER OF A CENTURY.

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA
STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY
OF
GASHOLDERS

AND
MAKERS
OF

REGd TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

SULPHATE OF AMMONIA PLANTS,

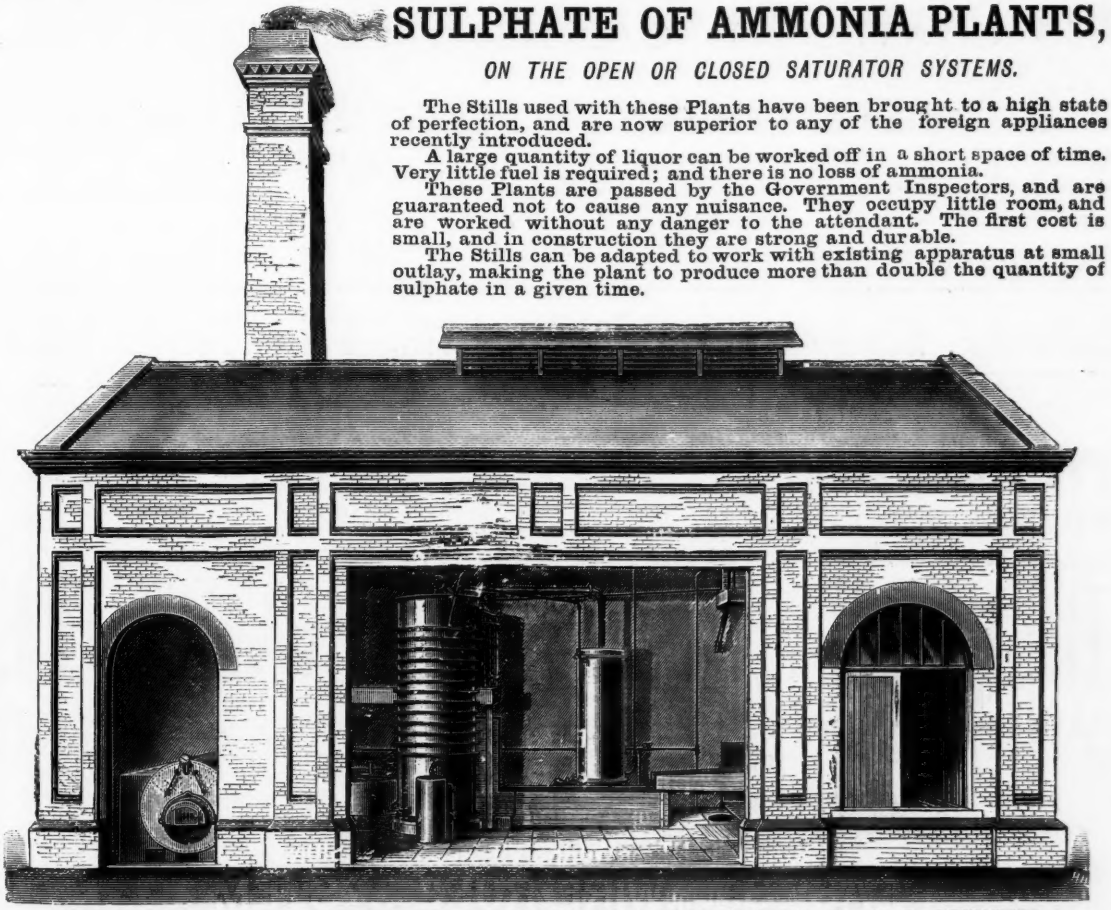
ON THE OPEN OR CLOSED SATURATOR SYSTEMS.

The Stills used with these Plants have been brought to a high state of perfection, and are now superior to any of the foreign appliances recently introduced.

A large quantity of liquor can be worked off in a short space of time. Very little fuel is required; and there is no loss of ammonia.

These Plants are passed by the Government Inspectors, and are guaranteed not to cause any nuisance. They occupy little room, and are worked without any danger to the attendant. The first cost is small, and in construction they are strong and durable.

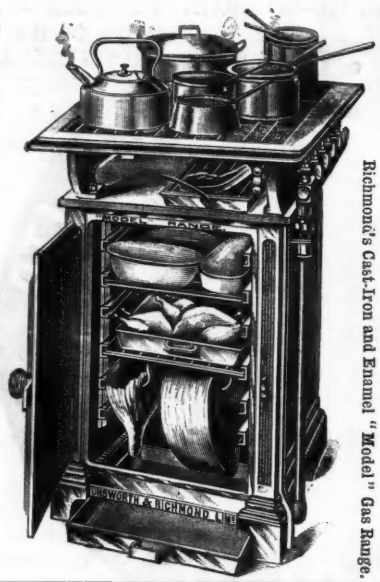
The Stills can be adapted to work with existing apparatus at small outlay, making the plant to produce more than double the quantity of sulphate in a given time.



FOR ESTIMATES AND ILLUSTRATIONS, APPLY TO THE SOLE MAKERS, R. & J. DEMPSTER.

LONDON OFFICES: 181, GRESHAM HOUSE, OLD BROAD STREET, E.C.

The best Stove made for Hiring out purposes. Can be taken to pieces readily.



Richmond's Cast-Iron and Enamel "Model" Gas Range.

UNSWORTH & RICHMOND, LTD.,

GAS APPARATUS MANUFACTURERS,

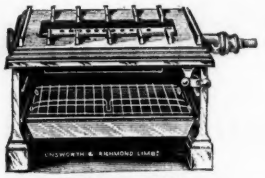
WARRINGTON.

This "Model" Range has been signally successful! So large a demand having been created for it, we have now for the second time in Twelve months enlarged our Works to meet the press of orders.

1.—Its chief advantage for hiring out is: All Oven Fittings, Hot Plate, Hot Plate Burners, Jet Cocks, and Gas Bar, easily removeable for Cleaning.

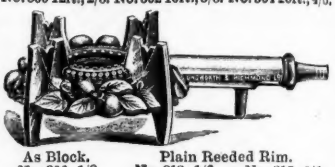
2.—To the General Public: Clean and neat appearance, Special Simmering Burners, Blue and White Enamel, Hot Plate Burners lift out to clean. No screws. Economical and Simple.

3.—The above points are confirmed by Nelson Gas Committee's test, June 3, in which U. & R's. "Model" Range beat Wilson's, Wright's, Davis's, and three other makers for Roasting, Baking, &c., and won first place against all competitors.



Quick Lever Grill.
No. 200 10×9×7½, 7/-. No. 205 12½×11×8, 10

Burners suitable for heavy work.
No. 300 12ft., 2/6. No. 302 16ft., 3/6. No. 301 20ft., 4/6.



As Block. Plain Reeded Rim.
No. 306, 1/8. No. 313, 1/6. No. 315, 3/6.
No. 308, 2/6. No. 314, 2/6.

No.	Inside Dimensions of Oven.			Hot Plate.	Height over all.	Burners on Hot Plate.	For family of	Price unpacked.	Packed and Enamelled.
* 30	11in.	11in.	17in.	17½in. × 17½in.	28in.	2	2	£2 10 0	£3 0 0
* 40	12in.	12in.	20½in.	18½in. × 18½in.	28in.	3	4	3 0 0	3 10 0
* 50	12in.	12in.	25in.	18½in. × 18½in.	32in.	3	5	3 10 0	4 0 0
100	14in.	13½in.	28½in.	24in. × 22in.	36in.	4	6		5 15 0
120	16in.	16in.	28½in.	25½in. × 23½in.	36in.	5	10		7 0 0
140	18in.	18in.	28½in.	28in. × 26in.	36in.	6	15		9 0 0
160	22in.	21in.	32in.	31½in. × 30in.	41½in.	7	25 to 30		13 0 0

* These smaller sizes are not fitted with loose Burners at present.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

Head Office: CORPORATION STREET, BIRMINGHAM.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.

TELEGRAMS "Gasholder"
MAKERS OF LARGEST GAS HOLDER IN THE WORLD
ASHMORE BENSON PEASE & Co
STOCKTON -ON-TEES
SIMPLE IN CONSTRUCTION
EFFECTIVE IN RESULTS
SULPHATE PLANT
DAVIS PATENT
ECONOMICAL IN COST & SPACE
STILLS IN STOCK 2 3 & 4 FT DIA
MAKERS OF
ALL GAS PLANT &
Every kind of Constructional Ironwork
OIL GAS PLANT FOR WORKS VILLAGES & MANSIONS
PEASE'S Patent WIRE ROPE SYSTEM
for Guiding Gasholders. Effecting a Saving of 25 per cent in Cost

TANGYES LIMITED,

CORNWALL WORKS, BIRMINGHAM.

LONDON: 35, Queen Victoria Street, E.C.
GLASGOW: Argyle Street.
JOHANNESBURG: Commissioner Street.
NEWCASTLE: St. Nicholas Buildings.
SYDNEY: Hay Street.
GENOA: 9, Via S. Ugo.
MANCHESTER: St. Mary's Gate.
MELBOURNE: Collins Street.
BILBAO: Gran Via 52.

THE TANGYE GAS HAMMER

(ROBSON & PINKNEY'S PATENTS)

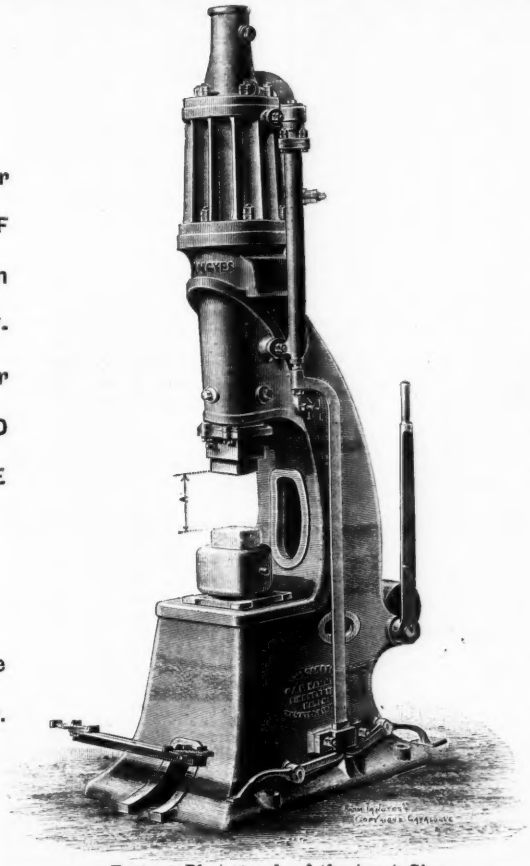
FOR USE IN

GAS-WORKS, SMITHIES, IRON-WORKS, COLLIERIES, &c.

TANGYES LIMITED, SOLE MAKERS.

With the smallest Hammer (¾ cwt. size), over 2500 OF THE HEAVIEST BLOWS can be given for ONE PENNYWORTH OF GAS at 2/6 per 1000 feet, or about 4500 varying blows with the SAME quantity of Gas.

The other sizes in like proportion, see table below.



The smallest Hammer (¾ cwt. size) strikes a Maximum Blow equal to that which would be given by A WEIGHT OF 3 CWT. FALLING THROUGH A HEIGHT OF ONE FOOT.

This can be repeated at the rate of 120 blows per minute.

From a Photograph of the 1 cwt. Size.

This Gas Hammer is now made with Hand Gear, Foot Gear, and loose Anvil Block as shown above, and is supplied in the following sizes:—

Size. Cwt.	Maximum Blow.* Cwt.	Blows per Pennyworth of Gas ** approx. No.	Blows per minute. No.	Maximum Distance A-Ins.	Total Weight approx. Cwt.	Measurements overall. Ins. approx. Height, Length, Width.
¾	3	2500	120	6	26	90 × 54 × 24
1	4½	1900	120	6	27	90 × 54 × 24
2	8	1600	80	9	38	110 × 60 × 27
3	10	1300	70	10	40	110 × 60 × 27

* The maximum blow in each case is equivalent to that of a weight the number of cwts. stated FALLING THROUGH A HEIGHT OF ONE FOOT.

** Based upon the Birmingham price to small consumers—viz., 2/6 per 1000 feet. The numbers given are for MAXIMUM Blows; a much greater number of VARYING blows can be obtained for the same quantity of Gas.

It will be seen from the data given above, that this Hammer may be economically used in competition with a steam hammer even in places where the price of Gas is at its highest. It is ready for work at any moment, day or night, and works as economically for a few minutes as when in sustained operation.

PRICES ON APPLICATION.

Telegrams: "TANGYES BIRMINGHAM."

Copyright. Entered at Stationers Hall. No. 57 E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

[Mr. SIDNEY HERSEY, Managing Director.] ADDRESS AT FOOT. [Mr. J. CHANDLER, Engineer.]

416 Patent "Standard" Washer-Scrubbers,

Equal to a Daily Capacity of 374,700,000 Cubic Feet of Gas,

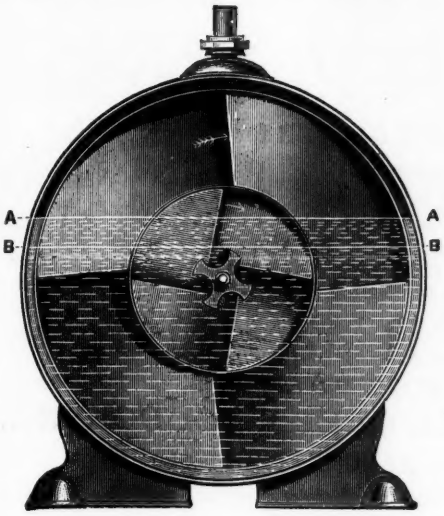
Erected and in course of construction at present date, amongst them being the following, viz.:—

(All new machines are supplied with improved wooden washing devices—"Bundles"—which can also be fitted to old Washers).

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,000,000
"	1,000,000
Balmain, N.S.W.	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co.	20,000
"	420,000
Bombay	700,000
Buffalo, U.S.A.	550,000
"	500,000
Brooklim, U.S.A.	300,000
Bergen	250,000
Berlin	150,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A.	1,000,000
"	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, U.S.A.	1,500,000
"	1,500,000
Chicago, U.S.A.	3,000,000
"	1,000,000
"	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charottenberg	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, "	500,000
" "	1,000,000
Düsselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W.	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000
LONDON:—	
The Gaslight and Coke Co.:—	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000
Shoreditch	2,500,000
LONDON—*Continued.*	
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms (2)	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co.:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
"	3,000,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
" (3)	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U.S.A.	1,000,000
Laclede, "	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lille	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U.S.A.	250,000
Lawrence, "	500,000
Lynn, "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N.S.W.	100,000
Minneapolis, U.S.A.	750,000
Magdeburg	300,000
Memphis, U.S.A.	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N.S.W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A.	1,000,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A.	750,000
" "	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburg, U.S.A.	1,500,000
Portland, "	560,000
Pawtucket "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A.	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N.S.W.	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Joseph's, U.S.A.	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A.	2,000,000
"	2,000,000
"	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A.	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A.	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubbs	300,000
Williamsburg, U.S.A.	600,000
" "	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A.	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A.	500,000
Windsor, N.S.W.	100,000
Wolverton	100,000
Wellington, N.Z.	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A.	750,000
Yeadon	500,000
Yeovil	250,000

ADDRESS: 3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, LONDON, S.W.

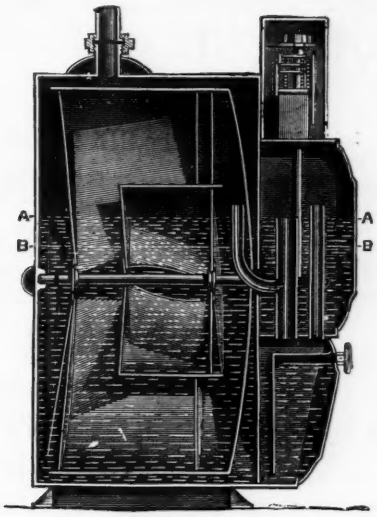
THE WARNER AND COWAN METER.



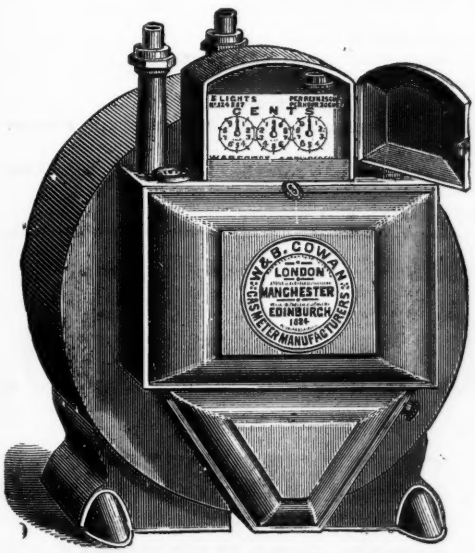
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

In its completeness as a measure, the WARNER AND COWAN drum differs from every other Of definite capacity, irrespective of the water-line, it can neither be over nor under filled, but discharges at each revolution the same volume of gas.

It is to this also that its secondary, though important, advantage is due—viz., the long float-range which this drum permits.

The illustrations show front and side views of the drum, and also views of the complete meter—both in tin and cast-iron case.

The drum being of fixed capacity within itself, the extraneous mechanism and arrangements are of the most simple character. These include all that is necessary, but exclude all that would be superfluous.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER,
LONDON, S.W.
TELEPHONE No. 3290.
"DISC LONDON."

DUTTON STREET, WORKS,
MANCHESTER.
TELEPHONE No. 1548.
"DISC MANCHESTER."

BUCCLEUCH STREET WORKS,
EDINBURGH.
TELEPHONE No. 753.
"DISC EDINBURGH."

TELEGRAPHIC ADDRESSES:

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

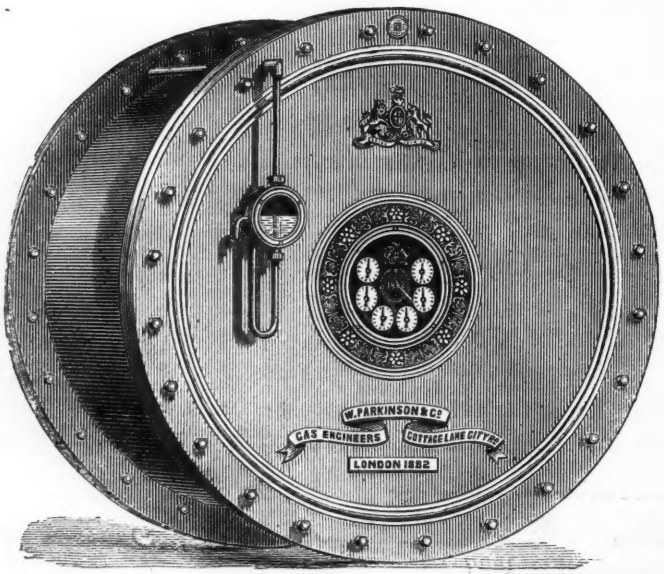
TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

HIGHEST AWARD, MELBOURNE EXHIBITION.

W. PARKINSON & CO.



STATION METERS

IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS.

MORE THAN

300 STATION METERS,

Varying in size from **1200** to **200,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction.

ROUND METERS as above are kept in Stock in all Sizes ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

COTTAGE LANE WORKS, CITY ROAD.
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS.
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE.
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt., p. 284.

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
The Affairs of The Gaslight and Coke Company . . . 247
The South Metropolitan Report . . . 248
The Standardizing of Photometers . . . 248
Gas Riots in Lisbon . . . 249
WATER AND SANITARY AFFAIRS—
The London County Council and the Extension of Constant Water Supply in the Metropolis . . . 249
The Condition of the River Lea . . . 250
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 250
Electric Lighting Memoranda . . . 250
The Examinations in Gas Manufacture . . . 251
TECHNICAL RECORD:—
North British Association of Gas Managers—Annual Meeting in Edinburgh—Papers and Discussions—
The Construction and Working of Regenerative Retort-Settings. By G. Love . . . 252
Unaccounted-for Gas. By D. Robertson . . . 255
Regenerative Gas-Lamps, with Special Reference to the Lighting of Large Interiors. By D. Macfie . . . 257
PARLIAMENTARY INTELLIGENCE:—
Proceedings on Bills during the Past Session . . . 260
House of Commons—London Water Companies' Rates . . . 260
LEGAL INTELLIGENCE:—
County of London Assessment Sessions—The Gaslight and Coke Company's Assessment Appeals . . . 260
MISCELLANEOUS:—
Meeting of The Gaslight and Coke Company . . . 265
South Metropolitan Gas Company—The Directors' Half-Yearly Report . 266
Meeting of the Brentford Gas Company . . . 266
Glasgow Corporation Gas Supply—Report and Financial Statement for 1890-91 . . . 267
Salford Corporation Gas Supply—The Hunter Frauds Again; The Right of Action against Contractors; The Alleged Attempt to Bribe the Gas Engineer; The Gas Committee's Annual Report . . . 268
The Brin Oxygen Process of Purification at Shrewsbury . . . 269
An Interesting Case of "Reasonable Security" . . . 270
The Belfast Corporation and Gas and Electric Lighting . . . 270
Notes from Scotland . . . 271
Current Sales of Gas Products . . . 272
The Lancashire and Northern Coal Trades . . . 272
Gas and Water Companies' Stock and Share List . . . 273
PARAGRAPHS.—Mr. S. Glover, 249—The Engineership of the Beckton Gas-Works, 249—Electrical Standards, 249—Death of Mr. S. Barratt, of Manchester, 249—The First Prizeman in the Examinations in Gas Manufacture, 249—The Metropolitan Water Inquiry, 250—Mild Steel Tubes, 250—A Fresh Development of the Circular Inquiry Nuisance, 250—The Standards Department and the Verifications of Photometers, 250—The Board of Trade Returns as to Gas Undertakings, 251—Mr. Nickson's Gas Institute Paper, 251—The Gas Question at Coventry, 264—New Joint-Stock Companies, 264—The Cost of Electric Lighting, 264—Extensions at the Wigan Gas-Works, 264—The Dangers of Electric Light Wires, 268—The Pretoria Water-Works, 269—The Dispute with the Lisbon Gas Companies, 270—Gas Apparatus Exhibition at Bournemouth, 270—The Alterations at the Newcastle-under-Lyme Gas-Works, 270—Proposed Purchase of the Exmouth Water-Works by the Local Board, 270—The Malvern Link Local Board and the Gas-Works, 272—Projected New Gas-Works for Stoke-upon-Trent, 272—The Gas Supply of Swinton and Pendlebury, 272—Skipton Water Supply, 272—Rating of the Barnstaple Water-Works, 273—York New Water-Works Company, 273—The Vyrnwy Aqueduct, 273—An Electric Lighting Scheme for Helston, 273—Progress of the Manchester Water Works, 273—The Increase in the Price of Gas in Liverpool, 273—York United Gas Company, 274.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but **Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.**

Telegraphic Address: "GASKING LONDON."
Telephone Number: 2759.

THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 11, 1891.

The Affairs of The Gaslight and Coke Company.

THE meeting of the proprietors of The Gaslight and Coke Company last Friday passed off much more quietly than might have been expected in the circumstances. It had been understood that the policy of the Board, in recommending the payment of a 13 per cent. dividend while the earnings represented little more than 7 per cent. on the ordinary stock, was the subject of serious discussion in the mysterious region known as "the City;" and the only mark of interest elicited from his auditory by the Governor (Colonel Makins, M.P.) in the course of his speech, attended his entrance upon the subject of the vanishing reserve. Nothing came of it, however; and the whole business was over in forty minutes. If financiers entertain any anxiety with regard to the policy of the Board, they were singularly neglectful of the opportunity afforded by the meeting for ventilating their opinions. It so happened, moreover, that no competent critic of the administration or management of the undertaking was present; and consequently there was no "heckling" of the Directors or their agents. The attendance of shareholders was not large; and there was a lifelessness about the whole proceedings which made everybody glad to get away. We have remarked before that the proprietors of this Company are exceptionally lacking in intelligent interest in the business that engages their capital. Probably in no Gas Company's meeting in the whole world is there more indifference shown to the character of the work done in carrying on the undertaking than there is in these Horseferry Road gatherings. If the typical Chartered shareholder were to be sketched by a character-artist like Sambourne or Furniss, he could only be represented as a sleek personage, in the conventional bondholder's "open-mouth-"and-shut-eyes" attitude. This is unfortunate for the public, for the shareholders, and for the Board. It favours the growth, at the Horseferry Road, of the spirit of oligarchy which is apt to be rank enough in any old-established joint-stock concern, even when the fresh air of public opinion sweeps freely over its proceedings. London, however, takes no interest in its own affairs; and therefore it would perhaps be unreasonable to expect the gas supply of the larger portion of the Metropolis to attract attention which is never bestowed upon any other question of Metropolitan Local Administration. The fact remains that, neither as Londoners nor as gas manufacturers, do the proprietors of The Gaslight and Coke Company exhibit any sense of responsibility for the work done in their name at the Horseferry Road.

Now, an oligarchy, and even an autocracy, may be a very good form of goverment, when it is well done. Indeed, a wise despotism is the usual form of government *de facto* in joint-stock industrial and trading concerns. This is an age of government nominally by Committees under a variety of designations; but it has been well said that the best committee for doing any real work is composed of three persons, two of whom are habitual absentees. We are consequently not so much inclined to quarrel with the fact that the management of The Gaslight and Coke Company is an oligarchy, as to complain that so little solicitude seems to exist anywhere with regard to the style in which this oligarchy does its work. Thus the meetings of the Company are attended by a hundred or so of proprietors, who never receive the Governor and his companions of the Court with the slightest appearance of cordial interest. They listen to the Governor's explanations, and troop out immediately after the dividend has been formally declared; leaving anybody who pleases to move a perfunctory vote of thanks to the Chairman. As to thinking of the work of the officers, or indicating a desire to recognize in any way the peculiar nature of the responsibility that falls upon those who are charged with the gas supply of an immense region, nothing of the sort must ever be looked for at a Chartered meeting. The South Metropolitan and Commercial proprietors may think of these things; but not The Gaslight and Coke people. All these care for is their dividend. It is apparently a work of supererogation for Colonel Makins to take the pains he does to make his audience comprehend the character of the Company's business. It is arguable how far this public indifference has influenced the quality of the administration of the Company; but it is certain that, among observers who are accustomed to look beneath the surface of such matters, there is more question about the management of Chartered affairs than concerning the working of any other Metropolitan Gas Company.

It could not be otherwise in the circumstances. Here is the case of the biggest Gas Company, not only of London, but of the world, which, with every advantage of position, is compelled to charge a higher price for gas than any other London Company, and, for the present at least, is unable to pay its way even at that. When it is inquired why the undertaking is in such a strait, it transpires that the principal items of expense in the conduct of gas supply—coal and labour—cost this Company more than

any other. The inevitable conclusion from such premises is that there must be something wrong in the administration. The pessimist may be inclined to hold that the process of concentration by amalgamation has evidently been carried too far in this instance, if smaller concerns can do their work more economically. The optimist may declare that, while mistakes have been committed somewhere, there is no reason why it should always be so. Both, however, must agree that the recent course of Chartered affairs leaves very much to be desired. Unfortunately, the speech of the Governor last Friday does not tend to retrieve the character of the head-quarters management. Colonel Makins spoke well, as he always does, and made out a plausible case in accordance with his brief. But much that he advanced will not hold water; and some arguments he pushed too far.

This was specially noticeable in the Governor's apology for the exorbitant increase of the expenditure chargeable to coal. He stated that the Company had not only been compelled to pay dearly for their raw material, but that its quality had also been inferior, so that it had been necessary to carbonize more of it, use more cannel, burn more fuel, and pay more in wages for getting the gas out of it. He laid so much stress upon this line of excuse, that he drew upon himself a mild query from a shareholder as to why the Directors allowed themselves to be so victimized by the artful coal-owners. Then Colonel Makins had to go off on the other tack, and protest that the Board had ample safeguards for the due fulfilment of their coal contracts. Evidently feeling that he was being led into making contradictory statements, the Governor sought a means of retreat by pleading that the Board could not extort the "pound of flesh" from their coal contractors. But why could not the Board meet these gentlemen according to those "hard, dry methods of business" gloried in by Colonel Makins, when it was a case of squeezing the utmost penny out of the South Metropolitan Gas Company? Is it only to coal contractors that the Chartered Board act in the spirit of the lines: "Be to their virtues very "kind; and to their faults a little blind"?

In following up the cue to throw upon Beckton all the blame for dear working, the Governor plainly betrayed a most unlovely aspect of Horseferry Road polity. Colonel Makins thought himself justified in parading the illness of the Engineer at Beckton during part of the half year, as an additional reason why the Company's working had fallen off with such marked effect upon the revenue account. Whatever may have been the true state of affairs at Beckton, it looks extremely bad for the head of a Gas Company to take advantage of the ill-health of a Station Manager for the purpose of piling upon his works all the discredit for undeniable general inefficiency. Unless very much better evidence on the point that the Governor's *dictum* is forthcoming, we shall decline to believe that the Beckton station has been any worse of late than usual, or that the responsibility for anything bad that has been going on there rests anywhere else than in the Horseferry Road. It must be left to Colonel Makins's conscience to decide, now that this view of his conduct in the matter has been stated, whether he has acted quite fairly to Beckton and its Manager. There can be no question that a manifestation of the readiness of the Board to make a scapegoat of any officer must be calculated to have a deplorable effect upon the *morale* of the whole service. The abandonment of their officers by the Board would mean a far more serious thing for the Company than any possible depletion of the reserve fund by a few unprofitable coal contracts; and we sincerely trust that the Governor's expressions on Friday are not to be interpreted in this sense.

The South Metropolitan Report.

In another column will be found the report of the Directors of the South Metropolitan Gas Company for the last half year. The accounts accompanying it will be published next week. We are unable now to deal fully with the important considerations arising out of this statement; but it may be remarked that, like The Gaslight and Coke Company, the South Metropolitan have again to draw heavily upon their reserves to pay the dividend of 13 per cent. The amount to be taken from the reserve fund on this occasion is £59,640, which will reduce the fund to the comparatively small sum of £60,000. In face of this condition of affairs, the Directors find themselves under the necessity, "with great reluctance," of raising the price of gas 3d. per 1000 cubic feet. Seeing that, although they have bought their coal well, it costs them 50 per cent. more, free on board, than it did two years and a half ago, this step could no longer be deferred. The increased price will come into force as from Michaelmas; and so a whole winter of higher returns will go far to equalize the accounts and reopen the prospect of cheaper gas. The report mentions several topics of a debateable character; but comment upon these we are compelled to hold over until next week. The meeting is to be held on the 19th inst.

The Standardizing of Photometers.

In another column will be found the substance of a "Memorandum as to Photometers" which has recently been issued by the Standards Department of the Board of Trade. It may be safely assumed that the promulgation of this official communication is not unconnected with the movement that has at last been started in response to the general demand for a reform of the stututory method of testing the illuminating power of gas. The Memorandum invites the attention of gas companies, engineers, and others practically interested in the measurement of gas to the requirements of the Weights and Measures Acts, 1878 and 1889, by which all "measuring instruments used in "trade" are required to be duly verified and stamped. It goes on to imply that a photometer is an instrument which comes under these Acts, and states that the Standards Department are prepared to receive for examination and verification any photometer in use for the sale of gas. The remarkable statement follows that "a certificate of "verification is, however, only issued if such photometers "are of the Evans or Letheby forms hitherto recognized "by the Department." It is evident that this declaration may mean much or little. Interpreted literally, as an official notification should be read, it means that no other than the specified forms of photometer will be legally valid for testing gas. The recognized forms are referred to as "the improved form of Bunsen's photometer, known "as Letheby's open 60-inch photometer, or Evans's "enclosed 100-inch photometer." This is tantamount to saying that all new modifications of the photometers named, whether designed by the London Gas Referees or anybody else, are inadmissible as standards. This is to make a clean sweep of much that has complicated the question of testing gas in London and elsewhere; and it puts a stop to the ingenious researches of such curious investigators as are never happier than when they have hit upon an "improvement" which makes gas look a little poorer in the photometer than it did before. The Gas Companies will naturally decline to be bound to the readings of any unstamped instrument, which will be as unalterable as the standard burner itself. This is perfectly fair; for if the Gas Companies are not allowed to improve the standard burner, why should the testing authority be at liberty to "improve" the instrument which contains it? All the same, it is a remarkable circumstance that the Standards Department should suddenly wake up to the consciousness of the fact that all sorts of unverified photometers are in use. But *does* the photometer come within the scope of the Act? Is it a "measuring instru-"ment used in trade?" In a sense, all science is measurement; but it does occur to us as arguable that a testing instrument is not necessarily an instrument of measurement in the strict legal meaning of the word. Literally, all the parts and accessories of a gas photometer may be describable as instrumental in the measurement of "length, "capacity, volume, temperature, pressure, or gravity;" but the whole instrument is used for no such purpose—it merely measures illuminating power. Moreover, the visual acuity of the observer enters into the purpose or application of the instrument; so that if the photometer must be inspected, why not the operator also? This is absurd, of course. But it strikes us that the literal enforcement of the new requirement of the Standards Department is likely to cause such a commotion in certain quarters, that all sorts of arguments will be raked up against it; and that those who have the infinite "improvement" of gas photometers at heart will be only too glad if they can prove an absurdity against the Memorandum in question. The legality of the notification will be the first thing to be called in question, especially as the wording is not couched in the imperative mood.

Gas Riots in Lisbon.

THAT a combination by two Gas Companies to cease contending for unprofitable spoils, and charge the maximum price allowed under their concessions, should be the occasion of a popular *émeute*, is a remarkable, even an unprecedented event; but it has happened in Lisbon. We published last week a brief notice of the Lisbon gas riots, and there is little to add to the dramatic summary telegraphed from the spot. From the price of gas to revolver shooting in the streets is doubtless a far cry; but the Portuguese populace seem to be qualifying for an unenviable reputation for turbulence and unreason. If a riot is to be the new-fashioned way of protesting against an unpopular increase in the price of gas, we may well pray that such an explosive fashion may be kept from invading this land of law and order, where the householder who thinks his gas too dear placidly sends to the oil-shop for his means of revenge. We are not concerned to defend the action of the Lisbon Gas Companies; but we take the opportunity for pointing out that competition, as a means of regulating the price of gas, must always fail sooner or later. It is childish to expect that capital invested in trade will be content to suffer loss for long, in order to continue selling something which costs more to manufacture than the price asked for it in the open market. Yet there are some obvious truths, such as this, which have to be demonstrated over and over again in different places. People still require to be taught economics, and other things, by experience, notwithstanding the fact that, although the teaching in this school is excellent, the school fees are terribly high. The idea of taking a question of gas prices "into the streets" is peculiarly repugnant to all one's notions of the fitness of things. Time was when bread riots were the order of the day, and when the burning of ricks was a favourite, although illogical, way of protesting against an artificial scarcity of wheat. Shooting a landlord from behind a hedge, when the policeman is not looking, is also, in some parts, a conventional method of procuring redress of an overcharge for a necessary of life. But street rioting and the shooting of policemen because Gas Companies elect to cease competing with one another for custom, is a consequence too ridiculous even to be tragical. We have not for a long time heard of anything so significant of the truth that, in the march of civilization, the people of the Iberian peninsula have been terrible laggards.

Mr. S. Glover, Engineer and Manager of the St. Helens Corporation Gas-Works, has just had his salary increased by £50 per annum as from the 1st of April last.

The Engineership of the Beckton Gas-Works.—On the eve of going to press, Mr. F. Beale writes to correct the report to which we gave currency last week, that he has resigned his appointment as Engineer of the Beckton station of The Gaslight and Coke Company.

Electrical Standards.—Just before the rising of Parliament last week, a report was presented by the Committee appointed by the Board of Trade to consider and report whether any, and, if so, what action should be taken by the Board under section 6 of the Weights and Measures Act, 1889, with the view of causing new denominations of standards for the measurement of electricity for use for trade to be made and duly verified. It was accompanied by the minutes of proceedings and evidence, appendices, &c.

Death of Mr. S. Barratt, of Manchester.—We regret to record the death, on the 26th ult., of Mr. Samuel Barratt, Manager of the Rochdale Road works of the Manchester Corporation. Mr. Barratt was well known to a large number of our readers in the locality in which his work was carried on; having been a President of the Manchester District Institution of Gas Engineers, and a member of the Reception Committee formed to entertain the members of The Gas Institute on the occasion of their visit to the city in 1885. He had been twenty years in the service of the Corporation; and, before his removal to Rochdale Road, was Manager of their Gaythorn station.

The First Prizeman in the Examinations in Gas Manufacture.—In noticing the results of the examinations in Gas Manufacture in our editorial columns last week, it was stated that the winner of the First Prize in the Honours Grade, First Class—Mr. Robert Watson—was of London. This arose from that being given as the place where the examination was conducted. We now learn that Mr. Watson is assistant to Mr. R. M. Couper, Gas Engineer of the Newbury Corporation. While making this correction, it may be of interest, in view of our remarks on the part taken therein by Scotland, to mention that Mr. Watson's mother is of Scottish parentage; while his father (now deceased) was a thorough Scotsman. He was Manager of the Kingston-on-Thames Gas Works about twenty years ago; and subsequently took charge of those at Monte Video.

WATER AND SANITARY AFFAIRS.

RAPID progress is being made with the extension of the constant supply in the districts of the Metropolitan Water Companies. Of course, in the East London district there is little margin for advance; but even there the proportion of house supplies on the constant system has risen from 94 per cent. at the close of last year to 96 per cent. at the present time. In May, throughout the districts served by the eight Companies there was an addition of 1867 to the number of houses on constant supply; and in June, a further addition of 1566. As the increase in the number of houses is only about a thousand per month, it is obvious that the constant supply has been overtaking the growth of the Metropolis. This will further appear by the fact that in the first six months of the year the house supplies were increased by 5793; but the houses supplied on the constant system underwent an increase of 14,037—producing a net gain of 8244 to the constant supply. If London and its environs are to undergo an addition of 11,586 houses per annum for some time to come, and the constant supply is to spread at the rate of 28,074 houses per annum, such being the arithmetical rates during the first six months of the present year, the constant supply will be universal in rather less than 17½ years from the present time. But there is the prospect of something more expeditious than this. At Midsummer the constant supply extended to about 63 per cent. of the houses; and this of itself is a large advance on the state of things as recently as twelve years ago, when the ratio was but 24 per cent. There is, however, a resolute effort now being made to render the constant supply universal in the Metropolis. In the month of June last, the Sanitary and Special Purposes Committee of the London County Council presented an important report on this subject. They remarked that hitherto the Council had only exercised its power of applying to a Water Company for a constant supply in those cases where a Vestry or District Board had requested the Council to do so. "But," said the Committee in their report, "we have now come to the "conclusion that it may be desirable for the Council to "take the initiative itself, and exercise this power "uniformly throughout the county." Referring to the fact that a large proportion of the Metropolis was still without a constant service, the Committee said they proposed to call upon the Companies to give, as soon as practicable, a constant supply throughout their districts. The New River Company were already prepared to co-operate in gaining this object. Certain arrangements had also been made with the Grand Junction and the West Middlesex Companies. Following this, the same Committee, at the last general meeting of the Council, sent in a report stating that they were proceeding in the matter, and recommended that the requisite notices should be forthwith issued to the New River and Chelsea Companies.

These active steps on the part of the County Council, to extend the constant supply, appear in singular contrast to the stolid attitude that was maintained by the Metropolitan Board in regard to this matter. According to the history given in the final report of that body, the Board, for certain reasons, had "not been disposed to call upon the Water "Companies to provide a constant supply of water in any "district." The Board simply went so far as to give its "concurrence" to any proposal on the part of a Water Company to bring the constant supply into operation. The process was thus left to the goodwill of the Companies, who from time to time sent the statutory notice to the Board that a constant supply would be given in certain localities. In this formal fashion the Companies went on; with the result that by the time the Board became extinguished, there was a constant supply of water over more than half London and the suburbs. So much progress being made under such chilling conditions, a triumphant kind of result may now be expected; the County Council having voluntarily approached the Companies with the object of inducing them to do that which, without being asked, they have already more than half done. The movement reflects credit on the Council; but if the Metropolitan Board had done its duty, the Council would never have had the chance of distinguishing itself in this way. What can we also say for the Corporation? Not long ago some of the parish authorities in the City asked the Corporation to call upon the New River Company to give a constant supply. What was the answer? That the cost of the

requisite fittings would be excessive; and that the expense would be too much for the owners and occupiers to bear! Yet the County Council have decided that this is the proper thing to be done throughout that part of London which lies outside the City. There is another anomaly yet to be considered. In dealing with the general question of the water supply, the members of the County Council indulge very largely in the assumption that the Water Companies can be dispensed with, or that a competing supply can be introduced. Nevertheless, we find the Council fraternizing with the Companies for the purpose of carrying the constant supply all over the Metropolis, although at a certain cost to the owners and occupiers of property. We may approve the action; but it seems a little out of character with a good deal of the talking—though it is pleasant to find the Council and the Companies agreed upon something.

Two long letters in yesterday's *Times*—one by Mr. John Lloyd, the other by "An Inhabitant of Herts"—have reference to the state of the Lea. Complaint is made that a portion of the water taken by the New River and East London Companies from the upper part of the Lea is required to sweep away the impurities of the lower reaches. It does not appear to occur to the gentlemen who make this demand, that if the impurities were kept out of the lower portion of the river, there would be no need to call upon the Water Companies to sweep the channel clean.

The Metropolitan Water Inquiry.—The special report from the Select Committee on the London Water Commission Bill, together with the proceedings of the Committee and the minutes of the evidence, accompanied by several appendices and a valuable index, was issued yesterday afternoon as a Blue Book.

Mild Steel Tubes.—Messrs. T. Piggott and Co., of Birmingham, some time ago manufactured and exported some mild steel tubes, from 32 to 36 inches in diameter, for an inverted syphon to be constructed under the direction of Major-General H. S. Palmer, formerly of the Royal Engineers, at Nisakamura, in the province of Hiogo, Japan. The firm have lately learnt that the tubes have proved to be completely successful. The syphon is 2488 feet long, and is thoroughly water-tight from end to end. The bottom of it is 180 feet below water level; and the 34-inch tubes used at that part are $\frac{3}{16}$ inch thick.

A Fresh Development of the Circular Inquiry Nuisance.—It would be interesting to know how many of our readers have been "favoured" by the Honorary Secretary of a Tradesmen's Association in a considerable town in the Midlands, with a circular in these words: "On behalf of the Association, I shall feel much obliged if you will kindly reply to the questions on the accompanying fly-leaf;" the writer being good enough to add: "I shall be pleased at any time to reciprocate the favour should the occasion arise"—as though there would be likely to be any chance of the Secretary of a Tradesmen's Club (of all people) being of the slightest service to a gas manager in a town dozens of miles away. The questions needing reply included: Number of inhabitants in the district; price per 1000 cubic feet of gas; discount (if any); rate charged for meter-rent (if any); price per ton paid for gas coal, and rate of carriage per ton in addition. There was also the following lucid inquiry: "If any interest allowed on meter-rents, what amount?" Such impertinence has met with at all events one well-deserved rebuke, in these words: "On behalf of my Company, I shall feel much obliged if you will kindly mind your own business—a favour which I shall be pleased at all times to reciprocate." It is to be hoped that many similar snubs were administered to the enterprising Honorary Secretary.

The Standards Department and the Verification of Photometers.—The Standards Department of the Board of Trade are sending round to gas companies, engineers, and others who are interested in the measurement of gas, a Memorandum on the subject of photometers. Attention is called to the requirements of the Weights and Measures Acts, 1878 and 1889, by which all "measuring instruments used in trade" are to be duly verified and stamped. In accordance with this requirement, the Standards Department are prepared to receive for examination and verification any photometer in use in connection with the sale of gas. Where the instrument is a Letheby 60-inch open, or an Evans 100-inch closed photometer, the official verification will include the burner, meter, minute-clock, scale, governor, pressure-gauge, and other subsidiary measuring appliances. A certificate of verification will, however, only be issued in respect of photometers of the Evans or Letheby forms hitherto recognized by the Department. We do not gather that it is legally necessary for a gas company to have their photometer verified by the Board of Trade, although practically it appears to be more desirable, for the sake of uniformity, that all instruments used in the measurement of gas should be made to agree with the Board of Trade standard. The matter was referred to in the Model Regulations issued by the Board on Jan. 1, 1890; and we assume that the present Memorandum is a semi-official notification to the same effect.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 273.)

THE Stock Markets re-opened last Tuesday, and developed a generally better tendency; but business was only limited. The favourable turn continued to hold good throughout the week, with a slight check here and there. Business was mostly for investments; and there was not much revival of speculation. Thanks to the improved tone and to the unvaried ease of the Money Market, prices generally were steady and firm; and but for the quietude of the season, they might have shown a rise. The Gas Market has been fairly active—quite up to the average for the time of year; choice high-priced stocks being well to the front. In Gaslights there were a good many transactions in the "A;" and although the price was put down 1 on Tuesday, the stock commanded steady figures all through the week, and the closing mark was almost the best of the period. A good deal was done in the 10 per cents.; and a little in the debenture and the limited issues—all at fair prices. But quotations did not move. The Company had a quieter meeting on Friday than their last; and fewer comments were passed upon the position of affairs. The Governor made no concealment of the inevitable necessity to make further inroads upon the reserve fund next year; but he put a hopefully moderate estimate of the amount probably to be required. With this estimate we may be content to remain satisfied for the present; and trust that the future may prove the forecast to have been accurate. South Metropolitans have been inactive. The "B" receded 1; but no business was done in it. The debenture, however, rose 1. One bargain in the new was all the business in Commercials. It is high time that Commercial quotations were amended; for the present 10 per cent. difference is unreasonable. Hardly anything was done in Suburbans and Provincials; but Brighton and Hove fetched top price. Of the Continental Companies, European and Imperial Continental were strong—the latter rising 1; but Continental Union (which had been put rather high) receded 5. Among the rest, the only feature was a fall of $\frac{1}{2}$ in Buenos Ayres. Moderate business, mostly in West Middlesex, was done in Water. The movements were adverse, though slight in degree.

The daily operations were: Tuesday's business was almost wholly in Gaslight "A" and 10 per cents. The latter were firm; but the former fell back 1. Transactions on Wednesday were better distributed; and prices were fair and unchanged. Thursday was extremely quiet; but the prices were better on the whole. South Metropolitan debenture advanced 1. But the "B" fell 1; and Buenos Ayres, $\frac{1}{4}$. Friday did not develop any change in the general tendency; but Imperial Continental improved 1. In Water, Grand Junction and Southwark receded 1 each. Saturday's business was almost entirely confined to Gaslight "A," at about average prices generally. Quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Effect of Electric Lighting upon Health—An Electrical Engineer for Glasgow—Electric Lighting "de Luxe."

REFERRING to a statement, which has been publicly made on more than one occasion, to the effect that the adoption of electric lighting in place of gas in the offices of the Savings Bank Department of the General Post Office has been followed by a marked reduction in the amount of sick-leave required by the clerks, the *Lancet* declares that it "has good authority for believing that the statement in question is substantially correct." If so, it is to be hoped that our medical contemporary, which dearly loves a bit of "sensational" matter, will publish the authority, and support him, whoever he may be, with reliable statistics. At present we have no hesitation in observing that the assertion is referable to a source in which we have very little confidence. It is one of those sweeping generalizations which catch the popular ear, and has, in point of fact, been put forward for this purpose. The *Lancet* admits that "the time which has yet elapsed since the introduction of the new illuminant has been insufficient for the collection of trustworthy statistics;" but goes on to remark that "there is every reason to believe that electric lighting will prove to be much more wholesome than ordinary gas-flames." We should have imagined that, in the admitted absence of trustworthy figures, the correct scientific attitude with regard to a question of this sort would be one of judicious reserve. To jump at a conclusion seems, however, to be a growing habit of the medical mind; and not even the warning of the Koch affair has sufficed to teach the *Lancet* caution. For ourselves, we do not desire to prejudge the subject of the comparative healthfulness of electric or gas lighting in either way. Anything which really and truly makes for the health of the community is deserving of recognition; but we are too well accustomed to the sanitary plea, generally employed as a last argument to recommend something which fails to gain favour on other counts, to readily admit its force in connection with office lighting by electricity.

The decision of the Corporation of Glasgow to appoint an

Electrical Engineer as a permanent official of the city is worth noticing as a sign of the times. The circumstance that a commencing salary of only £250 a year is offered to the first incumbent, is significant of the fact that electric lighting as yet occupies a small place in the estimation of the public-spirited Corporation of the Second City of the Empire. It is not very clear what degree of responsibility is intended to attach to the Electrical Engineer of Glasgow—whether, in effect, he is to be consulted upon the vexed question of the best system of supply to satisfy local conditions, or whether he will be merely an executive officer under the orders of a consultant like Sir W. Thomson. As we have remarked on a previous occasion when commenting upon the proceedings of the Glasgow Corporation under the Electric Lighting Act, it is a highly interesting process of development which is going on in relation to the application of the Glasgow Electric Lighting Order. The electric lighting affairs of the City of London having been so absurdly mismanaged, we must look to Glasgow as the next eminent illustration of municipal management in this class of business.

Decorative electric lighting appears to be making more headway than the plain and useful branch of the industry, if one may judge by casual references in newspapers to examples of lighting *de luxe* and by inspection of the fancy patterns of lamps offered for sale by the Edison and Swan Company. There is no longer any novelty in incandescent lamps embedded in blocks of ice for the decoration of ball supper-tables, &c. It is quite impossible for a chronicler to describe in a technical journal the vagaries of the decorative artists employed by the hospitable Upper Fifty Thousand of London during the season that is just over, to impart novel features to the arrangements for lighting town houses for various social "functions." Lighting, like floral decoration and upholstery, is made to yield new surprises to the eye in a thousand palaces in the wonderful West-end of London during the enchanted period which lasts from March till August. Nobody who has not seen the effects produced by the decorators when a Piccadilly or Park Lane mansion is specially dressed for an evening party, at a cost frequently reckoned in thousands of pounds, can entertain any idea of what such an interior resembles. The lighting, of course, has to be as *bizarre*, or tasteful, as everything else in house. The efforts made in the striving after originality in this respect are not always happy. When M. Jan van Beers, the Belgian painter, wanted to entertain a party of guests to dinner in his picture gallery, the table was of plate glass, covered with a cloth of the usual kind, but having underneath t 300 incandescent electric lamps in globes of various colours, which shone upwards through the table-cloth with effects as striking as they were novel. Once admit the possibility of this kind of thing, and there is no limit to the changes that may be rung upon the elements of an electric lighting combination. They may put electric lights and primary batteries into *cosaques*, for all we know, and require people to wear them like the paper garments supposed to be still popular at children's parties. All this, however, is to be taken for what it is worth. Mr. W. H. Preece once made great play with the lighting of a child's doll's house by electricity; but probably he grew rather ashamed of talking so much about his toy. A great deal of this fashionable fancy electric lighting is no more than playing with a toy which has to be dressed and re-dressed in ever fresh guise, if it is not to pall upon the taste of those who, while willing to spend money like water to procure a new sensation, are sharp enough to cut down expenses that bring no such recompense. There has never been so much electric lighting seen in the West-end of London as there has been used for various purposes during the past season. Some of it will be perpetuated as a lasting connection between the town house, fitted in the newest style, and the central lighting station. But, unless our observation has been greatly at fault, the revenue which the lighting companies can derive from many of these luxurious establishments will not be of a paying character. The lamp manufacturers will make most out of this class of trade; for any amount of money will be procurable for really pretty, striking, and novel lamps and fittings suitable for decorative purposes in the best houses.

The Board of Trade Returns as to Gas Undertakings.—Last Tuesday the usual returns as to the gas undertakings in the United Kingdom were presented to Parliament and ordered to be printed. These returns were ordered by the House of Commons on the 23rd of April; and, judging from previous experience, their issue as Parliamentary Papers may be expected towards the close of the year.

Mr. Nickson's Gas Institute Paper.—Mr. W. H. Harvey, the Secretary of the Incorporated Gas Institute, writes in reference to the intention expressed by several of those present at the recent Carlisle meeting, of availing themselves of a suggestion by the President, that those unable to take part in the "spoken" discussion should send a written copy of their observations upon the paper as soon as possible after the meeting, so that these remarks might be embodied in the transactions. Up to the present time Mr. Harvey has received only one such communication; and he asks us to request those who would like to take part in the discussion in this way, to send in their written contributions not later than Saturday next, the 15th inst.

THE EXAMINATIONS IN GAS MANUFACTURE.

The subject of technical education has been very much in evidence of late; and only during the past week statements have appeared in the newspapers relating to the application by different County Councils, to purposes of technical instruction, of portions of the funds coming to these local authorities out of the beer and spirit duties. This is one aspect of the subject. In the absence of exact information, we are inclined to suppose that technical instruction by county authorities will, at least in some respects, resemble in character the technical lectures and demonstrations of which there have been many examples, from the addresses of travelling lecturers appointed by agricultural societies, to the lectures on gas cookery organized by gas companies. This method of disseminating information is to be described as a sowing of seed broadcast, in the faith that if only one out of half-a-dozen seeds takes root and bears increase, the result will be worth the pains and the cost of the sowing. There is much to be said for this free way of teaching, without testing the result by examination, but letting the result speak for itself; but it must be acknowledged that, as a system of education, it lacks grip. This cannot be said of the scheme of technical teaching adopted by the City and Guilds of London Institute, whose work was briefly mentioned in last week's Journal. We desire to recognize in the fullest manner the endeavour which Sir Philip Magnus, the Superintendent of Technical Examinations, backed by his Committee, has made for many years past to develop the utility of this Institute as an agency for placing upon a sound basis instruction in the chief British arts and trades. It is, indeed, impossible to exaggerate the benefit which the Examinations Department of the Institute, when properly managed, is calculated to bestow upon the rising generation of British artizans and craftsmen. It is not that the certificate of any examiner, however acute and conscientious, can confer upon an able craftsman more than an evanescent reputation. We are nowise disposed to exaggerate the value of a pass certificate, which may, of course, be the reward of a lucky "shot" by a candidate, even if the examiner is so judicious as to defeat the mechanical trickery of a "crammer." From our point of view, the passing of an examination—although, when fairly done, it is a triumph upon which a candidate is to be felicitated—is only an incident of the complete scheme of education through which the candidates, one and all, have to progress. In such a scheme, the promoters and the examiner are as much upon their trial as the students whose acquirements they set themselves to prescribe and test. It is no small thing for an examiner to take upon himself the responsibility for drawing up a syllabus of what constitutes proficiency in any art. He publishes his own capacity as well as the nature of his subject. The Superintendent of the Examinations under notice has been very fairly successful, on the whole, in choosing for examiners men who are generally conceded to be competent representatives of the arts they are called upon to expound by their papers. Indeed, the Institute is to be congratulated upon the readiness displayed by eminent technicians to take part in the work of examination. It is not a great deal, by way of acknowledgment and reward, that these gentlemen can receive in return for their labours in the good cause; but such recognition as we can bespeak for them shall not be lacking now, or at any time when occasion serves for noticing their services.

Last week we published the pass-list and the papers set for the examination in Gas Manufacture by Mr. Charles Hunt, M. Inst. C. E., together with the programme for next year's examination. Mr. Hunt is to be praised for the air of actuality which he has succeeded in imparting to his papers. Mere "cram" would not carry a student very far through his questions. At the same time, the publication of a programme many months in advance protects candidates from surprise. Mr. Hunt's questions are fairly cast with a view to sounding the candidate's knowledge rather than to "catching him out." As we remarked last week, however, so we now repeat, that these papers do not tend to grow easier with the progress of time. We should unhesitatingly describe the Ordinary Grade paper as stiff. In the absence of the report stating the proportion of passes, it is impossible to state whether or not this observation is justified by statistics; but, on the face of it, this particular group of questions appears to be rather beyond the necessities of the competition. The Honours paper, on the other hand, is a very fair one—not easy, by any means; but well calculated to exercise the intelligence as well as to test the powers of observation of the candidate.

It is to be earnestly recommended that for every gas-works where there is an intelligent worker desirous of understanding the nature of the operations which go on under his eyes, or of improving himself and his work, a copy of the programme of these Technological Examinations for the ensuing session should be regularly had and attentively studied. There is more in the volume than the papers on Gas Manufacture, which a learner of this trade may profitably peruse. Making gas is only a particular branch of engineering and industrial chemistry. There is enough in it now to occupy a young man's attention for several years; but, unless he knows a good deal of some other industries, a gas maker will not be an eminent practitioner of his own art. Such subjects as civil engineering, ironwork construction,

chemistry, mathematics, &c., are outside the scope of the Technological Examinations; but it is worth while for the gas maker fo see what the examiners have to say about Coal Tar Products, Fuel, Electric Lighting and Power Distribution, Plumbers' Work, Mechanical Engineering, and Brickwork and Masonry. Not the least useful part of the programme is the list of books of reference appended to the syllabus of every examination. Properly treated, Sir Philip Magnus's little volume is a mine of suggestion, and, if not also of information, it tells the learner what he ought to know, and where he may obtain the necessary instruction.

By way of illustrating what may be learnt from the examination papers on subjects cognate to Gas Manufacture, let us take the paper set by Professor Meldola upon Coal Tar and its products. Here among more particularly special questions may be found such gas manufacturer's queries as the best way of valuing a sample of ammoniacal liquor, the effect upon the residual tar of adding cannel and shale to the coal, and the use of tar as fuel. Then, again, the paper on Fuel, by Professor A. K. Huntington, might almost be set before students of Gas Manufacture. In the Ordinary Grade paper on Fuel we find such questions as the following: "In what ways and for what reasons does Siemens producer gas differ from ordinary coal gas used for lighting purposes? What do you know about petroleum and its uses? What substances are used for lighting by incandescence? How may coal gas be made to give a non-luminous flame?" Also in the Honours paper on the same subject, we find such questions as these: "State the approximate composition and the properties of the principal fire-resisting materials used in furnace construction with which you are acquainted. Water gas is very largely used in America: Is it equally largely used elsewhere? If not, why not? Why is it that ammonia is found in the products of combustion of carbonaceous fuel? By what means is it extracted and obtained in a form suitable for use in the arts? In what way, and why, does coal belonging to different geological periods differ? State what you know as to the most suitable non-conducting material for covering pipes, boilers, &c., to prevent loss of heat." Every student of the gas industry ought to possess the information called for by these queries. Indeed, when it comes to a question of illumination by incandescence or flame, it is difficult to draw the line between the domain of Professor Huntington and that of Mr. Hunt. But this is only another way of pointing out the intimate relationship that exists between Gas Manufacture and other subjects. The subject of Fuel, moreover, is an odd one. It is not the name of any trade, like shoemaking, and consequently differs in its nature from most of the subjects dealt with by these examinations. In effect, it is a subsidiary study to Metallurgy, Gas Manufacture, and Mechanical Engineering; and therefore it might be taken up without much extra trouble by candidates of more than one category. We make this observation without forgetting what is needed for the acquisition of a Full Technological Certificate.

The Electric Lighting and Power Distribution papers for the year were prepared jointly by Professor S. P. Thompson and Mr. Gisbert Kapp. Judging from our imperfect knowledge of the subject, we should describe the questions as searching for both grades. One of the questions is as follows: "Describe the distribution of light round a continuous-current arc lamp. How would you proceed to determine the illuminating power of such an arc in any given direction? What is meant by mean spherical candle power? How is it calculated?" But there is no mention of the "French measurement" of electric arc lamps, with or without special reference to the real illuminating power of a Brush "2000-candle power lamp;" and this is a distinct evasion of a very practical issue. At the other end of its range, Gas Manufacture trenches upon, or is trenched upon by, Plumbing; for, in the examination upon the latter subject, questions are set upon gas-fittings, the measurement of gas pressures, forms of burners, meters, valves, &c. The Examiner in the large subject of Mechanical Engineering is Professor John Goodman, Assoc. M. Inst. C.E., whose papers this year are remarkably fair and to the point. It is hardly necessary to observe that no man can call himself a gas engineer unless he knows a good deal about steam engineering. Mechanical engineering, however, comprises much more than the study of the steam-engine; and although Professor Goodman has been compelled to divide both his papers into five sections, he has evidently not found it easy to compress his matter. This is one of the class of subjects in regard to which it would be useful if the answers to the questions were published. Generally speaking, this remark applies to all papers involving much arithmetic or mathematics, for in these the "technology" resembles scholastic work.

Many observations of miscellaneous interest will be suggested to the gas engineer who scans, albeit casually, the Institute "Programme." He must be struck with the measure of success that has been achieved by this great teaching and examining organization in many diverse fields of industry, while the nominal representatives of the same trades have been unable to do more than stand and look on. In gas manufacture, for example, how much has been said by partisans of the industry respecting the benefits of improved technical instruction, and how little has been done. Indeed, nothing has been done by those who might once have moved in this direction; and, but for Sir Philip Magnus and his Committee, gas manufacture ccording to British methods would be without an authoritative standard in the form supplied by the scheme of the City and Guilds of London Institute. One criticism on the list of works of reference upon gas making, &c., published in the Institute "Programme," may perhaps be permitted. We notice that whereas the value of periodical literature, transactions of technical societies, &c., for purposes of instruction, is freely mentioned by the writers of the syllabus of the examinations upon Iron and Steel Manufacture, &c., the bibliography of gas is restricted to the titles of eight or nine formal text-books. Valuable as these are, the student would rapidly fall behind the times if he read nothing fresher than these authorities; and it is to be hoped, in the interest of candidates, that sources of contemporary information will not be ignored in future editions of this student's guide.

TECHNICAL RECORD.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Edinburgh.

(*Concluded from p.* 211.)

The third paper read at the meeting was by Mr. G. Love, of Paisley, as follows:—

THE CONSTRUCTION AND WORKING OF REGENERATIVE RETORT SETTINGS.

On being asked by your President to contribute a paper at this meeting, and considering the various subjects upon which to write, I very naturally resolved to give one on a matter to which I have given considerable attention—viz., the construction and working of regenerative retort-settings. On looking over the annual reports of this Association, I find that for the past eight years this question has occupied your attention to a considerable extent; and papers of very great merit have been written on it, by gentlemen well qualified to speak on the subject. Their complete description of the Siemens, Klönne, and other systems, presently at work in our midst, will limit my paper (unless I go over old ground) to a description of the construction and working of the regenerative system at the Paisley Gas-Works.*

The first construction, on a large scale, of Mr. G. R. Hislop's method of regenerative firing was in the Spring of 1888, previous to this we had several ovens of four retorts at work for a couple of years, the thorough success of which led to a larger construction on the same principle. In one of our retort-houses we had two benches of 40 retorts each, working back to back; the chimney being placed between them. These were at work on the open system of firing—two retorts in each oven, with ten ovens on either side; making in all 40 retorts, with 20 fires, per bench. This method of setting was due to the inferior quality of the coke used. In order to give the new system a fair trial, it was resolved to take down one bench. In this space we found that eight ovens (four on each side), of eight retorts per oven, could be built—making in all 64 retorts—as compared with only 40 retorts formerly occupying the same space; thus effecting a saving of 66 per cent. of retort-house area. The ovens were 8 ft. 6 in. wide by 9 ft. high to the inside of the crown of the arch from the floor-line; while to get the proper depth of producer and travel for the regenerators, we had to excavate 5 ft. 10½ in. to the bottom of the foundations. In making these excavations, we had to go 3 feet lower than the foundations of the retort-house gable wall; necessitating the underbuilding of it to this extent. This was successfully accomplished—building widths of 3 feet at a time, putting in wedges well driven up, and, after completion, making a thoroughly safe and substantial job. We have two main flues—one for each side of the bench; and these are started on the top of concrete foundations, with a 14-inch wall between them. Each oven has four outlet ports to the main flue, and is so built as, if necessary, to be easily cleaned through into the main flue from the front of the bench. Formerly our main flue was on the top of the bench, having uptake flues in the centre wall of the oven. But by placing the main flue underneath, there is less liability to fracture, no loss of heat by radiation takes place, there are no uptake flues, access is easier for cleaning purposes, and there is a saving in solid brickwork.

The producer and the regenerators are built inside the ovens, and are so constructed as to be taken down separately, if necessary, for repairs, without damage to the other parts. The regenerators are placed on either side of the producer, and are formed of two backing-up tiles—one against the wall of the oven, and the other against the wall of the producer—with vertical division-tiles dividing or separating the two flues; the whole space being spanned by one tile. This, however, was found objectionable, as not being easily jointed; and two cheeked tiles were substituted. The secondary air is admitted near the bottom of the sunk chamber, by means of an air-tight sliding disc arrangement; the air travelling backwards and forwards five times the full length of the oven—altogether about 30 feet of travel—before entering the combustion chamber.

* An illustrated description of Mr. Hislop's arrangement of regenerative retort-settings, as supplied to small works, appeared in the course of the report of the 1888 meeting of the North of Ireland Gas Managers' Association (see JOURNAL, Vol. LII., pp. 379-80). The original patented arrangement was described in the JOURNAL for Dec. 9, 1884, p. 1045.

The waste gases from the oven pass down in the opposite direction to the secondary air, and have on the same level as the admission port of the secondary air a down-going port with dampers placed one on either side of the oven, for controlling the draught. Immediately underneath this damper there is an escape port to the chimney; but this port is controlled so that a large proportion of the gases flow down and along underneath water-pans, for the purpose of generating steam—thus saving the supply of steam from a boiler outside, and at the same time more fully abstracting the heat from the waste gases. These pans are made of cast iron, and have a protecting tile underneath. From the side of the regenerators, and passing over the pan, is thrown a curved plate of cast iron, having on the top boxes forming ports for the admission of air and steam to the producer. Inside these plates is the pan chamber. The outside or top of this plate is covered with the side arch brick, forming the sides of the bottom of the producer; and separating these two plates at the bottom is placed a cast-iron sole-plate 6½ inches broad. You will thus observe the absence of any moveable parts in the furnace. In the front wall of the oven at the pan chambers, and on a level with the top of the pan, are built cast-iron frames fitted with air-tight doors; being faced all over, and having a moveable disc arrangement for the admission of air for the supply of the producer. On top of this frame, ½-inch malleable iron tubing is led, for the constant supply of water to the pans.

The sides of the producer are started on top of the curved plates, over which an arch is thrown, with ports through the crown of the arch into the combustion chamber on the top. Between the two bottom retorts, and on the top of the producer, is placed the combustion chamber, the top of which was made a continuous arch, with outlet-ports for the gases to the oven; the crown forming the bed for the centre retorts. In the front wall of the producer are built two doorways. The top one is formed above the floor-line, and used for charging the producer; this process being accomplished by hand. The under one, which is near the bottom of the producer, is to allow of the latter being cleaned out. Covering all is a cast-iron front plate, bolted to which are cast-iron mouths fitted with air-tight doors, having bridles, screws, &c. By this means the producer is kept perfectly air-tight. Spy-blocks are placed in ports carried through the front wall into all the secondary air and waste gas flues. By this means every part is easily got at, and can be cleaned out when necessary. For facility of access to the cleaning-door, to the pan chambers, and also to the regenerators, a sunk chamber is formed 8 ft. 10½ in. long from the front of the bench, the same width as the oven, 8 ft. 6 in., by 4 ft. deep; brick steps being built in the back wall for the purpose of getting down and up. The sides of each sunk chamber are formed by the extension of the division walls of the ovens to the back wall of the sunk chamber. These form a rest for the bench-binders, and also at the same time save heavy cross-ties, which otherwise would be necessary to withstand the outward thrust of the bench; thus keeping the entire bottom of the walls thoroughly solid and safe.

The bench-binders, which are formed of two heavy malleable iron plates placed 10 inches apart, and bolted together through distance studs, are let down 2 feet under the surface of the division walls of the sunk chamber; and bolted to the binders near the floor-line is a thin malleable iron pocket, set into a chamber for the purpose of carrying air down into the sunk chamber for the necessary supply of secondary and primary air to the ovens. The sunk chamber is covered at the sides by cast-iron chequered plates being carried by the walls and T-iron bars, while in the centre are two hinged doors and a moveable plate for the purpose of getting underneath; the whole making a very strong and substantial, and at the same time a comparatively cheap job. The retorts are supported upon six piers 9 inches broad, carried up to the centre of the top retorts, having 9-inch spaces between each pier. These piers are formed of special blocks, each made to suit the position on the side of the retorts; thus very much simplifying the building. The blocks, as well as the whole of the brickwork from the top of the producer upwards, have a great percentage of silica in their composition, so as to thoroughly withstand the heat.

The furnaces were first lighted for drying the ovens; and a gradually increasing fire was kept on till this was done. We then commenced firing with four-hour charges (these being light). But after a few days' working, these were increased to three-hour ones; and very fair heats were obtained. The coke from the two bottom retorts was drawn into low bogies, and charged by hand into the producers; this being found sufficient to maintain the necessary heats. The coke from the other six retorts was drawn into barrows, and taken out of the house to be slaked. The furnaces were cleaned out every twelve hours at this time. In the case of most of the furnaces, we were not very much troubled with clinker, although they were not what we desired. This was owing to the flues under the pans being too narrow, and also to the pans being allowed to run dry. We had also some little difficulty in regulating the primary and secondary air supply, as well as the extent of damper; but these troubles were due to the men slaking the coke before charging the producers. They did this because it was not very easy to throw red-hot coke into the producer. The consequence was that the heats fell considerably after a fresh charge of fuel—showing very decidedly the necessity of charging with red-hot fuel, so as to secure the minimum production of carbonic acid at the outlets of the producer. We experienced some trouble also with the combustion chamber, having at this time only one for each oven. The heat being too much confined, owing to the smallness of the parts, &c., the brickwork melted, and formed large stalactites on the crown of the arch. A portion of it falling in necessitated the putting out of the furnaces, and the repairing of the chamber. Bricks containing 90 per cent. of silica having been procured, the damage was easily rectified (all parts of the work being readily accessible without injury to other parts); the retorts were then re-lit, and were kept going all the winter, to our complete satisfaction.

The great saving effected by this bench, as compared with the old system warranted the erection of more; and it was resolved to put up two other benches, containing 64 retorts each—making in all 192 retorts on the regenerative principle. Profiting by the previous winter's experience, several very important improvements were effected as follows: (1) The arch of the producer was improved and uptake ports were placed on either side, instead of one row in the centre, as formerly. (2) The secondary air ports were brought in on the bed of the combustion chamber, instead of through its sides. (3) We had two combustion chambers instead of one, with a solid 9-inch wall running the full length of the oven, between them; and we also did away with the arch (the top of the chamber being open), but the placing of a protecting tile under the bottom of the centre retort was necessary. (4) The piers for staying the retorts were made 6 inches instead of 9 inches broad, as formerly. (5) The introduction of a patent shoot arrangement, whereby the red-hot coke is drawn from the two centre retorts directly into the producer. This shoot, when working, is at such an angle that the coke is regularly placed throughout the entire furnace. It is a fixture to the bench, and of simple construction, while all parts are maintained air-tight. When inoperative, it folds back out of the way, and presents a very complete and satisfactory method of filling the producer. With these exceptions, the ovens are built in accordance with the description already given.

These improvements had the desired effect; producing results even better than were expected. The heats maintained in the retorts are very great. There is no hemming-in of the heat at any part; but combustion takes place nearly throughout the entire length of the setting. The two centre retorts, being a little hotter than the others, are each charged with 1 ton 2 cwt. of coal, while the side ones have 1 ton each per 24 hours—all three-hour charges. Each oven carbonizes altogether 8 tons 4 cwt. of coal per 24 hours; giving a yield of 9908 cubic feet per mouthpiece per day, or 9667 cubic feet per ton of coal. The quantity of coke used in the producer is 26 cwt. per 24 hours; or, as it is usually stated, 15 lbs. of coke per 100 lbs. of coal carbonized—the coke used containing 7½ per cent. of ash. For comparison with results in English coal—say, with 3 per cent. of ash—the fuel would be 10½ lbs. per 100 lbs. of coal carbonized. The producers were cleaned out every 36 hours; but latterly we have been doing this every 24 hours—no trouble whatever being found from clinker. We attribute this to the method of introducing the steam and to the shape of the patent producer; the steam making the clinker soft and friable, and keeping the lower portion of the producer cool, while the shape causes the coke to be held up in the form of an arch by the hot film of clinker, while the softer ash is being drawn out at the bottom through the cleaning-door by means of a rake. Thus the great rush of cold air into the oven is obviated while the furnace is being cleaned; and besides this no dust can get into the setting, as both air and dust are trapped by having to pass through the mass of red-hot fuel suspended in the producer, as already described. We found that the quality of coke used for firing purposes is of some importance—splint making the best coke; although until lately we used a mixture of splint and second-class cannel, and found no difficulty with clinker.

The advantages of this system over the former methods of working are higher heats, and these maintained (not fluctuating, as formerly), and consequently a larger production of gas. This is shown by the increase last year of 272 cubic feet per ton, as compared with the results on the old plan; and this, too, with an inferior class of coals. In making a comparison, attention must be given to the quality of the coals used. This increased make is from a mixture of about one-half splints, one-fourth shales, and the remainder second and third class cannels; and this for gas of 27-candle power. The life of the retort is also prolonged. We are this year renewing the same number of retorts, after a make of 254 million cubic feet, as we did when our make was 190 millions; and this notwithstanding the fact that by having three-hour charges we get one-fourth more work out of the retorts than we did then. The saving in labour is 3·46d. per ton of coal carbonized. The retort men are much better pleased to work with the new than with the old system; and well they might be, as their labour is less, and not so trying as before. The saving in fuel is very considerable.

The cost of the first bench erected, exclusive of hydraulic mains, connections, and 40 bridge-pipes, was £1140 5s.; being £17 16s. 4d. per retort. The cost of the next two benches (128 retorts) was £2445 1s. 8d.; being £19 2s. 0½d. per retort, or an increase of £41 5s. per bench. This was owing to the rise in the price of ironwork. The total cost of the three benches of 192 retorts was £3585 6s. 8d.; being at the rate of £18 13s. 11d.

per retort. This sum included all material and workmanship, except the hydraulic mains and connections, and 120 bridge and dip pipes; and it was also exclusive of royalty. The saving in coke and workmen's wages alone paid for this extension in fifteen months; and had the prices obtained formerly for coke been maintained, the actual expenditure would have been met in twelve months. The economy effected in these two items for the past year, as compared with the old plan, has been 2s. 8½d. per ton of coal carbonized. I ought to mention here that previous to the adoption of this system the whole of the retorts were in use during the winter; and we could not further extend our benches, as all the retort-house space was used up. By the introduction of the plan I have described, with its saving of 66 per cent. of retort-house area, we have been enabled to avoid for at least three or four years, the expenditure of a large sum for a new retort-house; and I think we are at least entitled to put to the credit of this system 5 per cent. for the sum necessary for such an extension.

In order to ascertain the condition of temperature to which our retorts were subjected, and to what extent the heat was abstracted from the waste gases before entering the chimney, I inserted a pyrometer into the main flue near the chimney, and found the temperature to be 600° Fahr. Testing it back to the interior of the oven through the various flues, it gradually rose till, on reaching the combustion chamber, the outer shell of the instrument, which was made of cast iron, melted after being inserted for five minutes; the metal running along the bed of the chamber like water. We were enabled, however, to make out the temperature to be about 2700° Fahr., and this pretty equal over the oven, while the secondary air is heated to 1700° Fahr. before coming into contact with the producer gases; thus clearly showing a slow and thorough action of the regenerators.

This system is applicable to settings of from two up to eight retorts, and it has been adopted in various places in Scotland, and also in England, Ireland, and America, in all of which it is giving very high results and general satisfaction. The cost of erection varies very much in different localities, and also according to the number of retorts in each oven. In an oven of six retorts, the extra expense, as compared with the old system (including royalty), is £60. But when we consider the fact that we get one-fourth more gas per mouthpiece per 24 hours, and an increased yield per ton of coal through higher and more regular heats, it will be found that, instead of an excess, it is just the reverse, being really a saving on the old system, and this entirely independent of the large economy effected in fuel, wages, and retort-house area.

Discussion.

Mr. J. West (Manchester), on the invitation of the President, opened the discussion. He said he was hardly prepared to do so; but it was a matter in which he was certainly very much interested. The paper threw some light on the subject; and the results were very good indeed. He should like to ask the writer two or three questions; and first of all as to what kind of material he used. Was it cannel, or a mixture of coal and cannel? because he was not quite *au fait* as to what was done in Scotland; and he should like to have particulars on this point. As regarded regenerative furnaces, he thought that the question was pretty well settled. He was a great advocate of the system himself; and in its early stages he carried out some very extensive experiments thereon in Manchester. They did the same as their friends had done. They worked them, but really did not know how to manipulate or to regulate them. They found that it was very necessary, if they wished to succeed with these furnaces, that they should have the very best material they could get; and some of the Scotch material, such as the Glenboig, certainly turned out better than that which they could get in England. He was glad to see that they had presented to them an inside producer. It was probable that in Scotland there were many advantages in using an outside producer; but in England they did not appreciate them very much, perhaps because their coals were of a different sort—there being less ash in them. The inside producer certainly appeared to him to be far superior to the outside one, because with the latter they must lose a quantity of heat by radiation; whereas with the former they had all the heat mostly expended inside. Several things suggested themselves to him. The first was the shoot that conveyed some of the coke into the furnaces. He did not know the object of the door below that shoot. In England they had only one place in which to drop the coke, and another below for drawing the clinker out. He saw that, in the furnace described, the producer was directly under the retorts; but in England, and especially in some furnaces with which he had experimented on a very large scale in Manchester, they came to the conclusion that it was better to have the producer brought out a little in the front. By this means they could drop the coke straight into the producer—it required no pushing back in any way; and there was a saving of fuel, with less work for the stokers. Another thing he did not understand was why there should be two exit flues. There might be an advantage in this; but they had not found it to be so in England. He had not tried the arching in the inside of the oven, as shown; but he supposed he might conclude that there was something to recommend it. The arrangement for evaporating the water was doubtless advantageous. They used pans; but when they had ash in them they did not get sufficient steam. At Nottingham they had introduced in connection with the flue a little boiler for generating steam, because they wanted more steam than they could evaporate underneath the bars. In all probability the plan shown would meet the case. The arrangement of the flues was very similar to his own. It appeared to him the cost was very low; but he did not quite understand whether or not the figures given were for the setting without the cost of materials.

Mr. T. D. Hall (Montrose) said he could not add anything to the discussion, so far as experience was concerned; but a remark made by Mr. Love had struck him. He said they had been in the habit of using splint coal, and that it answered very well. Numbers of them had not had any experience with regenerative furnaces, but they all knew what coke was; and although he found the coke of splint coal very good—better, he might say, than the coke from English coal—the addition of a little cannel rather improved than deteriorated the quality of the coke. He mentioned, for Mr. West's information, that in Scotland they had some cannel coal which produced very good coke. During the railway strike, he had occasion to introduce some Newcastle coal; and he had great difficulty in keeping their fires going with it alone. But having put in some Scotch cannel, the clinker disappeared. They had no regenerative furnaces. But they had air flues; and he could not say they had found any difference between the old furnaces and those with the flues.

Mr. J. Hepworth (Carlisle), on being invited by the President to take part in the discussion, said he had come to the meeting as a learner rather than in any other capacity. He might say, however, that he was much struck with the facts Mr. Love had given—too rapidly, he acknowledged, for his comprehension—one after another. One that had interested him most was as to the cost, to which Mr. West had referred. He (Mr. Hepworth) had had regenerative furnaces at work, and he advised everybody to have them. He did not, however, know anyone who had had such as those described; but if the results stated could be attained, it was a very important thing. He would not discuss the question of the setting they had before them with reference to the producer. If, however, Mr. Love had had any experience with settings such as those he showed, with two or three retorts in an oven, and could tell the meeting something about the results, when the brickwork did not go so low down into the ground as in the larger ones, he should be very glad to know the relative advantages that would be obtained with a setting of this sort as compared with a setting of eights. Another thing which struck him was that, where they had the main flue upon the setting, they might sometimes take advantage of it in order to obtain heat from it in some way. He had not at present a setting of this kind, except in one bench. He did not see why they could not insert, in or near to this flue, a pipe that would convey air to the outside, and be delivered at the point required over their coke furnaces. Probably Mr. Love and Mr. Hislop would have had some experience in this direction. If they had, he (Mr. Hepworth) would like very much to know from them whether there was any possibility of getting assistance of this sort in a cheap way. He assured the members that he was much pleased to be present at the meeting, and had been extremely interested in the papers read.

Mr. J. M'Crae (Dundee) said he had studied Mr. Hislop's furnaces very carefully, and thought they were the correct thing, especially for small gas-works. He would not, however, say they were the best for large ones. He had several on hand just now. Judging from the reports he had received from those who had had experience with them, the economy was very decided; in fact, the amount of saving seemed to him to be very great indeed. He had recommended them in several cases where ten or twelve retorts were required; and they had turned out satisfactorily.

Mr. A. Smith (Aberdeen) said it appeared to him, at the first glance, that there was not much difference between the system before them and the Siemens regenerative system. There was no doubt that it worked by the method of taking back from the setting the heat that had been used. It was really, to his mind, amusing to see the twisting and turning that had been tried in order to overcome the Siemens patent. They knew that a great deal of improvement upon the Siemens furnaces had been made by different gas engineers; but he really thought that people should honestly accept the system, and not try to evade it. What advantage was to be gained by these over the Siemens system? He did not believe they would earn more by them than they would by the Siemens system.

Mr. M'Crae thought it would be a most unfortunate thing if it were to go forth from the meeting that Mr. Hislop's process was anything like the Siemens system. There were many points of difference; and it was only to the practical student that these points appeared.

Mr. Smith said the system took the heated air that used to escape to the chimney by the old process, back to be employed again.

The President called Mr. Smith's attention to the internal producer.

Mr. Smith said he did not dispute that.

Mr. Love, in reply, said he was obliged to the members for the kind manner in which they had received his first paper. Mr. West had asked what kind of coal they used. He stated in his paper that it was made up of one-half splint, one-fourth shale, and the rest second or third class cannel. In reference

to the quality of bricks, this was very important. They found great difficulty in this respect, and had to get some bricks made with about 90 per cent. of silica in them. With these they found they had no difficulty, because they would stand heats up to about 2800° Fahr. before melting. At these heats the bricks stood two or three years' work. He certainly found the inside producer a very great advantage. They had no loss of heat by radiation, as was the case with the other system. As to the doors, about which Mr. West had asked, they adopted those they had, so as to give accommodation for cleaning. They did not charge by the door to which Mr. West had referred. In his paper he stated that when they withdrew their clinker it formed itself into a natural arch. He thought the producer was better inside the wall of the oven, because the more they brought the producer forward, the more they exposed the bench to the action of cold air. Besides, if they were to bring the producer 15 inches or 2 feet forward, they would have difficulty in getting the whole of the coke spread over the entire area of the producer.

Mr. WEST: Oh, much better than by that means.

Mr. LOVE really thought that Mr. West was wrong. He thought it was desirable that they should have the coke as equal as possible over the whole producer, otherwise there would be waste.

Mr. WEST: But we do get it over the whole producer.

Mr. LOVE understood Mr. West to say he worked six-hour charges, while in Scotland they worked three-hour charges; and he (Mr. Love) certainly thought a *sine quâ non* process would be an improvement. With reference to the generation of steam, he might remark that they found quite sufficient steam in their pans, and they had to watch that they did not become burned. Mr. West asked about the cost of the bench. His reply was to refer him to the paper, which showed, in the second case, a cost at the rate of £18 13s. 11d. per retort, inclusive of everything. He would have been pleased, when he mentioned the subject of small works, if some of those who were engaged in them had given their experience of these furnaces, which were being built in various places in the country. With reference to flues, they considered two to be necessary to support the centre of the bench. They were constructed large enough to give plenty of room for cleaning out. Altogether he thought the centre wall made a much more stable job. Mr. M'Crae had made some remarks about small works, which he (Mr. Love) looked upon as complimentary. At the same time he thought that those at Paisley were not small; and he might say that he had taken from their books the figures he had given. They were simply their results as to the saving of coke and other matters.

Mr. M'CRAE remarked that he never meant it to be inferred that Paisley had not most significant works.

Mr. LOVE said, with reference to the advantage to be gained by using their own as compared with other people's systems, in preparing his paper he resolved not to touch this matter, because he knew nothing about them. He simply wrote about what he knew at Paisley.

The PRESIDENT said he had been working with these furnaces for six years—his works being the first into which Mr. Hislop introduced them; and he made the statement openly, that at first they did not know very well how to manage them. They proved almost a failure, and cost a good deal. But at the end of three years they renewed them, and put in another furnace. It was certainly an improvement; still there was a want of that which they would have desired in the way of keeping up the regularity of the heats. Last spring they introduced two ovens—one of four, and the other of five retorts; and the results of their working had been most satisfactory. It took them all their time to keep down the heats—they were so excessive. In fact, if they closed up the ports, and prevented the air getting in, the result would, in some cases, be too much heat.

Mr. SMITH: What would be the saving?

The PRESIDENT could not say exactly what it would be in small works; but he should think as much as 25 per cent.

Mr. D. ROBERTSON (Dunoon) read the fourth paper, which was as follows:—

UNACCOUNTED-FOR GAS.

The term "unaccounted-for gas" is, of course, understood to mean that proportion of the annual manufacture which fails to give any indication of its existence through the medium of consumers' meters and other legitimate channels whereby the consumption of gas is recorded. While there cannot be any doubt in the mind of a gas manager at the end of his financial year as to the percentage unaccounted for, there may still be serious doubts as to where and how it is all getting lost; and it should be the aim of every manager of a gas-works, whether large or small, to leave nothing undone which could be expected to reduce this percentage still further. From statistics supplied for the year 1875 by the West of Scotland Association of Gas Managers, I find that the average return for leakage was 17·43 per cent.; and last year the North British Association returns show the average leakage to be 12·78 per cent.—a reduction of 4·65 per cent. in fifteen years, which clearly indicates that Scottish gas managers have, during that time, been fully alive to the importance of this branch of their business.

I am sorry to say that at Dunoon our percentage of gas unaccounted for is expressed by two figures—being 13 per cent. on our make; and it has taken a great deal of work to reduce it to even that figure, as our district is somewhat widely spread, with 17 miles of main pipes to supply 13 million cubic feet of gas per annum. One cause of our high percentage of leakage is that we have to provide distributing plant capable of supplying a population of 20,000 persons, three-fourths of whom reside in the district only three months out of every year; so that if our consumption was at all in proportion to the capacity of our mains, we should probably be in the happy position of some of our friends whose leakage is less than 5 per cent. I understand that our leakage twenty years ago was 33 per cent.; and six years ago, when I took charge of the works, it was 26 per cent.—a condition of matters, which you will readily admit, is not conducive to paying high dividends.

For the past six years we have been using every means in our power to reduce the leakage to respectable proportions; and having managed to come within "measureable distance" of the average, we feel that ours is not altogether a hopeless case. Our mode of operation was, in the first place, to pierce the line of main in districts where we had reason to think gas was being lost; and, by this procedure, a great number of bad leaks were discovered and stopped. We have since, at different times, examined all the mains in a similar manner; and although it may cost more in wages for a month or two, at the end of the year it shows considerably on the right side of the balance-sheet. We also instituted a system of rewarding parties who call with information of escapes on the roadway; and we have found this plan to work admirably, as many a man or boy will feel a stronger inclination to walk perhaps half a mile to lodge the information, if he knows there is a shilling at the end of the journey, than if there is nothing. Besides, if any information is worth paying for, I consider it is that which, although costing only so small a sum, enables us to prevent waste to the extent of pounds in value. Scavengers, policemen, and postmen, who are constantly on the road, are our best detectors of escapes.

Mains and services we have found to be the chief causes of leakage; and attention directed to this part of the plant will not fail to yield beneficial results. I may say that I have found Pitkin and Niblett's coal gas detector of great service when searching for leaks, especially in places where it would be unsafe to use a light. But although mains and services are the chief outlets for unaccounted-for gas, they are not the only ones; for if consumers' meters are not regularly watered and overhauled, things are not as they ought to be. For instance, an old wet meter watered three times a year might be failing to register at least one-fourth of the gas passing through it. It might indicate correctly for three months after being watered; but in the remaining month it registers nothing. The inspector goes his round, finds a certain quantity of gas registered, and considers it all right. The meter is then watered, and goes on for another three months, only to stop again at the expiration of that period. This might continue for years, and nobody be any the wiser, unless the inspector is of an inquiring turn of mind, and has the meter taken out and a new one put in its place, to pay for its own cost in a year or two.

I consider it to be mistaken policy to keep down expenditure by retaining in the place a lot of old meters that should be occupied by new and efficient ones. Anyone who has ever performed the duties of meter inspector can understand the feelings of a painstaking officer when he discovers a meter passing gas without registering it; and, on informing the consumer that his account will have to be charged on the basis of the same quarter in the previous year, he is usually met with a grumble, and the statement that "much less gas has been used this quarter." Some months ago a case occurred in my own experience, in which a lady complained very much of the amount of her quarter's account. She said she was sure the meter was going fast, as she had not burned all the gas for which she was charged. She wanted another meter; and to satisfy her, and also myself, I had the one she was using tested, when I found it registered 20 per cent. *slow*. It is almost unnecessary to say that I changed the meter. The lady was pleased, and so was I, but for different reasons. Of course, this is not an isolated case, for I have no doubt many of you could bring to recollection similar incidents in your own experience; but it certainly shows the wisdom of having a systematic testing of meters.

Service connections to mains are another source of vexation to a gas manager who wants to get his leakage down to as near zero as possible. I have on several occasions discovered connections where the main had been bored a little too wide for the tap. The form of tapping had been gone through, and the malleable tube not screwed in, but slipped in, and carefully rubbed with white lead to prevent it leaking. This was effectual probably for the first week, after which the pipe began silently to contribute its quota to the percentage of unaccounted-for gas. This kind of work I believe to be not owing to careless workmen, but to incompetent ones. Sometimes a local gas-fitter who is not conversant with this kind of work, and who perhaps has not suitable tools with which to do it, finding he has made a bad job, buries it underground as quickly as he can. But more often the mischief is caused by the individual known by the appellation of the "handy man," who is employed in many small works. I would advise managers of works like those of which I have charge to steer clear of the "handy man" for main and service laying, and rather employ one who has served an apprenticeship to a trade such as a gas-fitter or a blacksmith, and who would be willing

to put his hand to rougher work when necessary. I have found this to answer well in my case; and I am of opinion that it is the best plan. I would also suggest that, when a good man is obtained, he should be left a great deal to himself as to the manner in which he does his work. No doubt many of us are very particular and painstaking, more especially when we are supervising another man's work; but it is a mistake to be too exacting, as it is apt to sour a good workman.

Street lamps are, almost without exception, a certain source of loss in every town. This is owing, in a measure, to a separate service-pipe being required for each lamp (thus multiplying the number of connections to the main), but also, in a far greater degree, to the fact that much more gas is, as a rule, consumed than is allowed for when an annual charge per lamp is made. In our own district, for some years previous to 1886, the charge per lamp for the season from the middle of August till the end of April, allowing six nights out of every month when the moon was supposed to be shining, was 13s., using a No. 2 Bray's burner, from dusk till 11 p.m. But in 1886 the average meter system was adopted—the other conditions of lighting remaining the same as formerly; and at the end of the season we found that instead of 13s., the amount consumed per lamp was 18s. 10d., subject to 7½ per cent. discount. This was equal to a reduction of 2 per cent. in our leakage account, and an increase in revenue of 5s. 10d. per lamp, although the lamplighters were under much stricter supervision, owing to the lamp-meters having been fixed.

Condensation is supposed by some to account for a large proportion of the loss; but I am inclined to believe that it affects the gas more adversely in quality than in quantity. My reason for this belief is that in one part of our district we have a stretch of 3-inch main-pipe extending three miles along the sea shore; and our total revenue from this main amounts to about £70 per annum, or 280,000 cubic feet of gas sold. Taking the percentage of leakage on this road as the average of the whole district would give 36,400 cubic feet; and adding it to the gas sold would give a total of 316,400 cubic feet. Allowing 1 per cent. of this for loss by condensation yields 3164 feet; and supposing the specific gravity of the gas lost to be ·600, we should be able to pump out of the drips 144 lbs. of liquified hydrocarbons, or equal to about 14 gallons of pure liquor. We do not get so much pure liquor as this out of the 22 drips in the road in question, in the course of a year. Therefore, I think that I am justified in assuming that the loss by condensation is considerably less than 1 per cent.

It has been said that dividends are made in the retort-house, but may be lost in the street mains; and this remark applies with double force to small gas-works supplying widely-extended districts, where the gas, getting into long stretches of idle mains, has really nothing to do but to try and get out by the nearest leaky joint. Our duty is, of course, to keep it under control until it has reported itself at the consumer's meter, from which it passes into the service of another master, who, under the present system, may use or abuse it as he pleases. Our responsibility practically ends on our delivering gas into the consumer's meter; but we ought, if possible, to keep a watchful eye on its progress from the meter to the point of combustion, and endeavour, as far as lies in our power, to educate the consumer into the most economical and efficient way of using gas for lighting, cooking, and heating. If we do this efficiently, we shall have our reward in a larger consumption per customer, and thus open one of the readiest channels to a decrease in unaccounted-for gas, by increasing our sale of gas per mile of main.

Discussion.

Mr. P. Watson (Stirling) said the first thing one ought to do was to ascertain whether or not the station meter was right; and the next, to see if the gas was maintained at about the summer temperature. Professor Lewes, of London, had delivered a lecture in which he gave tables for calculating the loss of gas for every degree of temperature, as well as by aqueous vapour; and he thought it would have been well if Mr. Robertson had consulted this lecture.

Mr. A. MacPherson (Kirkcaldy) said that, like Mr. Watson, he thought the first thing was to see that the station meter was registering correctly. Mr. Robertson had cited an instance in which he had had a consumer's meter 20 per cent. wrong. It was quite possible that his station meter was in error to the same extent, only he had never tested it. How he could have wet meters going for three months he (Mr. MacPherson) could not see, unless he had some extraordinary arrangement which was not to the Gas Company's interest. They in Scotland sold in winter a very large quantity of gas at a temperature of about 30° to 35° Fahr.; and if they measured it at 70° or 80°, it could easily be seen that they were not losing all the gas they were apparently doing, because they were over-measuring it when produced. Again, in selling it, they were under-measuring it; and so they had a deficit at both ends. Unaccounted-for gas was a thing he did not think was properly "leakage" at all. They must take all the circumstances into consideration. Some people were fortunate in having near their works large consumers who took 30 or 40 per cent. of the entire make of gas. Others, again, had to send the whole of it over a very large area. Then he also thought the number of consumers was to be taken into account. In the matter of unaccounted-for gas, they had had comparisons made between England and Scotland. But it must be remembered that in Scotland, in a town of (say) 30,000 inhabitants, they might possibly have 6000 consumers, for all of whom service-pipes had to be provided; whereas in a town of the same size in England, there would perhaps be only 2500 consumers. These were all matters that must be looked into before they could compare one place with another. At the same time, he thought Mr. Robertson was quite right in saying that no one ought to employ the "handy man," who was really the greatest loss a gas company could have. These men considered they were "handy;" but their employers found out, sooner or later, that they were not.

Mr. G. R. Hislop (Paisley) said that he would simply content himself with alluding to the subject of controlling the gas supplied to the public lamps. He had many times been surprised to find that there were no means of doing this. In many cases, no doubt, there was a loss of half the gas that was consumed. This was an important contribution to the leakage account. In Paisley he adopted the regulator system, which, he thought, was better than the average meter system. The simplest of all plans, in his opinion, was to get the needle governor burners which Mr. Peebles supplied, passing 2 cubic feet of gas per hour. They were perfectly accurate; and by putting them on all the lamps, and taking the total hours they burned, and the number of lamps, they had, at the end of the month or year, an exact statement of the quantity of gas burned. This was an exceedingly handy way of arriving at the consumption in the public lamps; and he was very glad to hear that Mr. Robertson had proceeded on proper lines in this respect.

Mr. T. D. Hall (Montrose) thought, with Mr. MacPherson, that there were hardly two places which could be put upon the same footing. In his own case, they had a very level town; and although, in one instance, they sent gas for three miles, he considered their leakage was very low. He agreed with Mr. Hislop that the principal causes of leakage in medium-sized towns were waste in the supply of gas to the street lamps, bad fittings, bad stopcocks, lights blown out and the gas turned on again, &c. In his own town they did not employ regulators, on account of the place being very level; but they used a first-class burner, and with this, the consumption being understood to be 2½ (though he often found it was 3) cubic feet per hour, they had, he was sure, very little loss. Then the lamplighters frequently, when cleaning the lamps, let a burner "blow" for a few minutes, in order to get rid of water; and this gas was, of course, all lost.

Mr. J. M'Crae (Dundee) remarked that the subject before the meeting was one which had interested him very much for a long time, because this was the most flexible matter in their balance-sheets. Mr. Robertson's paper had been very carefully considered; and he (Mr. M'Crae) thought it was perfectly true. He must, however, diverge a little from the writer's line of argument to say that meters, and meters alone, were the cause of the leakage. He had just had an experience which illustrated this. They had a 200-light dry meter which was 31 per cent. slow. Now, a number of such meters would make a very serious difference at the end of the year. He had sent into every lane, alley, square, and court in Dundee, and had also caused every manhole to the public sewers to be tested by the smell, and all the leakage that could be discovered in this way was a mere trifle not worth mentioning. The great source of leakage was undoubtedly the meters; and he thought that all kinds of meters should be tested periodically. By doing this it was wonderful what they would discover; and they would be able to reduce their leakage by it. In Dundee the leakage only amounted to about 7 per cent. It was perfectly true, as Mr. MacPherson had stated, that they could not compare two towns, because the circumstances might be so different that they really could not institute a comparison. He thought the subject was worthy of the most scientific attention gas managers could bestow upon it, in order to find out, first, whether or not the unaccounted-for gas was lost; and secondly, if it was lost, how this was to be prevented.

Mr. W. Key (Glasgow) said he had listened with pleasure to Mr. M'Crae's remarks. He thought, however, that the one about meters being the sole cause of the unaccounted-for gas was not altogether correct. He would relate his own experience. Mr. M'Crae said gas managers should go about this matter scientifically. Some twenty years ago, in a place where he was Manager, the gas account was paid by the Police Commissioners; and they had the two meters which were upon all the lamps in the town—the all-night and the short-time lamps—in the Police Office. The all-night lamp burned over the office door; and the short-time lamp in a lane behind. Believing the Gas Company were not getting payment for all that was consumed in the town, and, taking advantage of the "hue and cry" then raised for dry meters, he suggested to the Commissioners that they should have dry meters put on a number of lamps throughout the town. The Town Council assented; and 20 dry meters were fixed. In the first six months there was an increase of exactly 100 per cent. on the street lighting account. This was apparently rather too much to give; and they were not allowed to have it long. The accounts began to show a decrease so rapidly that he could not tell how it was; and he set himself to find it out. He had to procure a pair of goloshes with which to travel the streets during the night; and with the aid of these he discovered it. He and an assistant went out at night for some months and walked about till four and five o'clock

in the morning. One night they were upon a hill where there was a meter lamp; and they ensconced themselves behind an entrance gate. Two policemen came up; and as soon as they arrived at the lamp-post, one climbed upon the other and extinguished the light.

Mr. WATSON remarked that a good many of the managers present were young men, but if they referred to an early volume of the JOURNAL OF GAS LIGHTING, they would find a case of a manager in a town on the Clyde who had no leakage; but when his station meter was examined, it was found to be 20 per cent. slow. That was the reason he had no leakage.

Mr. ROBERTSON, in reply, said he felt very gratified that his paper had been the means of raising so good a discussion. He did not attempt to touch the reasons of unaccounted-for gas so much as to give the members his experience. They could follow his example if they pleased. Mr. Watson had made some remarks about the station meter. To these he could only reply that his meter was correct. Since reducing the leakage, they had considerably increased the production of gas per ton of coal carbonized, which showed that it was not at the expense of the make that they had lowered it. Mr. Watson had said he had never known of a meter that stopped at the end of three months. He (Mr. Robertson) had met with a number of them. He had found a wet meter registering correctly at the end of this period; and he had gone again at the end of the three months, and found it standing. It seemed to be the case with some wet meters that, when the water fell below the scale level, the gas passed without actuating the drum. He had no doubt that wet meters caused a great deal of the leakage; and unless they were properly watered, they failed. He did not think, however, that wet meters were the sole cause of unaccounted-for gas; but he believed that dry ones also required to be looked after. He thanked the members very kindly for the way in which they had received his paper.

On the motion of the PRESIDENT, a vote of thanks was accorded to Mr. Robertson.

Mr. D. MACFIE (Edinburgh) then read the last paper, on

REGENERATIVE GAS LAMPS.

The system of regenerative gas-lighting has been on its trial for a number of years; and it may not be out of place to inquire whether, and how far, it has met with popular favour and proved worthy of recommendation and general adoption. I am not here to discuss the relative merits of competing lamps, and shall confine my remarks to the system generally and to its particular application; for I wish to approach the subject from a practical, rather than from a scientific, standpoint.

The introduction of the system is one of the most important events in the history of gas-lighting; and it is matter of surprise that its merits have not been more freely recognized. Several causes have, no doubt, contributed to this state of matters. First of all, the public maintains a sceptical attitude towards all improved methods of gas-lighting; and consumers generally (while not proof against the wily burner hawker) do not take the trouble to understand the merits of the regenerative lamp, and often, when convinced, will not take the further trouble of careful superintendence. Society, too, has developed a preference for table decoration under a subdued light in a canopy of gloom—resulting in "the cult of the paraffin lamp;" and yet the public, which patiently endures the inconveniences of oil-lamps, thinks it too much trouble if progressive methods of gas-lighting require more than the turning of a tap and applying a light.

But the public is not alone to blame; for regenerative lamp makers, by a scale of prohibitive prices, have themselves barred the progress and popularity of the system, and limited their field of operations accordingly. If I were in the councils of any lamp-making syndicate, I should (knowing as I do the difficulties and worries of the regenerative-lamp crusade, and the limitations under which it is conducted) recommend them to cater rather for a large demand at popular prices, so that new sources may be tapped, and the lamps brought within the reach of all.

It may perhaps be suggested that the members of the gas industry, who know the merits of the system from a scientific standpoint, are not without rebuke in their lack of enthusiasm for the cause; but it must be borne in mind that there are inconveniences connected with the fitting and the manipulation of regenerative lamps, and also risk of failure owing to carelessness or ignorance on the part of gas-fitters. For it is no more than the truth to say, that gas-fitters generally have taken little pains to understand or appreciate the system. They have been shy of tackling the mysteries of the lamp's parts and accessories; and now with their timidity, and again with perverted ingenuity in the matter of fitting, they have too often upset the essential safeguards to success, and made the system a scapegoat for their own offences. Where fitters have got hold of the essential principle of regenerative lamps, and taken the trouble to understand the novel features of the fittings, a happier state of matters has been the result.

It must, of course, be admitted that one of the chief drawbacks to the general adoption of these lamps, lies in the complications, nice adjustments, and delicate working parts, as yet inseparable from their efficient working. The advantages of the system, in developing the illuminating power of gas, are freely recognized; and, without going into fractions or technicalities, it may be stated as a general rule, that any ordinary regenerative lamps may be relied on to increase by at least 150 per cent. the light from any given consumption per hour. In practice, one may safely guarantee that equal light will be got from little more than one-third the consumption of flat-flame burners in the usual type of fitting; while, for a given consumption, it is equally safe to count upon almost treble duty from regenerative lamps as against ordinary burners.

If, for example, we take a room 36 feet by 18 feet, lit by twelve burners consuming in all 42 cubic feet of 25-candle power gas at ½-inch pressure, the result may be taken at 210-candle power. If we substitute two regenerative lamps consuming a total of 16 cubic feet per hour, against 42 cubic feet, equal light would be maintained; while if two larger regenerative lamps be employed, consuming in all 42 cubic feet per hour (equal to the twelve burners superseded), the lighting power would be almost trebled, and the room would be much overlit. If the system under discussion trebles (or only doubles) the lighting value of coal gas, it is alike the interest and duty of all concerned to recognize the fact, and make it known where such information would be serviceable.

By the invention of the regenerative lamp, gas authorities have had put into their hand the strongest weapon of defence, in face of the electric crusade, which in its warfare is not slow to use any weapon that comes handy, so long as gas is the object of its onslaught. In a fair fight, gas has nothing to fear from its most powerful rival. But while it may be a sign of strength to despise your enemy, this is not always a sign of wisdom; and in the public interest I take the liberty of suggesting that sellers of gas should make it plain by some official pronouncement, that consumers are misled as to the relative cost of gas *versus* electricity as an illuminant.

It would be easy to show—first, that on the most favourable computation, and under the best known system of distribution, users of electric light must be prepared to pay at least three times the cost of gas burned in the most ordinary way. Second, that it is possible to light dwelling-rooms with gas on approved methods as effectively as with electricity at less than one-fourth of the cost, with no risk of failure in the supply. Third, that taking the figures of electricians as a basis, the cost of lighting rooms with electricity as compared with 25-candle power gas at 4s. 2d. per 1000 cubic feet is about six times the cost of regenerative gas-lighting, and three times the cost of flat-flame burners of the ordinary type.

No clear understanding exists as to a standard of comparison between gas and electric light; and electricians have been allowed to base their figures not upon the best, but the least favourable methods of burning gas. With our present candle-power standard it would be too much to expect our rivals to take any account of improved methods of developing the illuminating power; but we have the right to insist that some regard be paid to the quality of gas under comparison, as well as to the price paid for it per 1000 cubic feet.

It appears as if the best quality gas known to electrical engineers were 16-candle power, while they are wide awake to the *price* of 25-candle power gas. As a case in point, I think it proper to call attention to a most invidious and misleading comparison, which appears to have been made (without protest) before the Royal Scottish Society of Arts in Edinburgh a few weeks since, as reported in the *Scottish Leader* of May 12. The speaker was Professor A. B. W. Kennedy, the Engineer-in-Chief to the Westminster Electrical Supply Corporation; and his subject was "The System of Electric Lighting at Present in Use in Various Parts of London." He is reported to have said that "The cost of electric light in houses" would "probably be from 20 to 30 per cent. in excess of gas at 3s. He believed that gas in Edinburgh was 4s.; and probably their houses could be lit by electricity cheaper than that." You will notice that there is not the least hint as to difference of quality in the rates quoted per 1000 cubic feet. But the Professor goes on to say that "the cost of electricity was one-farthing per hour for an 8-candle lamp, or one-halfpenny per hour for a 16-candle lamp." Let us charitably assume that Professor Kennedy was not aware that, while he spoke, Edinburgh was being supplied not with 16-candle power gas (which I assume covers his reference to 3s. per 1000 cubic feet) but with gas of 25-candle power, which we will take at 4s. 2d., instead of 4s., as quoted by the Professor; and now see how these figures work out. Let us find an equivalent to the 16-candle power lamp which is said to cost ½d. per hour. With 25-candle power gas at ½-inch pressure, we get 5-candle power per foot; and with a consumption of 3½ feet, we get 17½-candle power, as against the 16-candle power electric lamp. We may burn 3½ cubic feet per hour for 100 hours for less than 1s. 6d., while Professor Kennedy wants 4s. 2d. for his electric lamp, or 175 per cent. *dearer*, instead of being "something cheaper than our gas at 4s. per 1000." In calling attention to this misleading statement, I am content to base my comparison on the result from ordinary gas-jets, leaving out of account the enhanced results attainable by regenerative lamps.

I do not share the fears of those who anticipate an easy victory for electricity as the popular illuminant; while at the same time we should be prepared for its adoption as a luxury amongst those who can afford to pay for it, and who will not look too narrowly into the cost of electrical installation, nor consider too closely the charge for renewals.

Having said so much by way of introduction, it is my duty to

point out wherein the system of regenerative gas lighting is in advance of the open flat-flame system which it has sought in some measure to supersede. Before the introduction of the system under discussion, it may be said that there had been no essential change in the early types of Argand, batswing, and union burners, and that all improvements were directed to the combining or perfecting of these primitive types. It is true that, apart from the many trumpery devices foisted upon the public by way of "economizers," real progress had been made in the direction of controlling or governing flat-flame and Argand burners, and increasing their efficiency. This was done by careful selection of tips, and automatic control of pressure, on the sound principle of burning gas with large volume and low pressure. In this connection it is enough to mention the names of Sugg, Peebles, and Bray, to remind us of their attainments in this and kindred directions. But with the results of these inventors before us, it may be said that nothing more is to be expected on the old lines, unless (by the way) it should happen that Mr. Hislop's painstaking experiments, as to the standard angles in the drilling of burners suited to the various qualities of gas, may be found to mark a still further stage in advance.

Now that we have the regenerative lamp before us as an accomplished fact, it seems strange that gas engineers should have been so long content to aim at perfection on the old lines. The regenerative lamp appears all so simple when the thing is done. You have only to exclude cold air contact from the flame, and in its place supply a stream of heated air by the influence of the flame itself, and turn your Argand burner upside down, when, behold, your lighting power is doubled or trebled, as the case may be. It is immaterial whether this great increase is within the flame itself, or is enhanced by the disposition of the flame; for it is after all with the result that we have to do. In view of the regenerative lamp, the deficiencies of the flat-flame system become apparent. With the exception of sun-burners (the most extravagant of all gas-burning apparatus), primarily devised as much for ventilating as for lighting purposes, gas appliances seem to have been devised more as a means of lighting the upper walls and ceiling than of the habitable portion of our apartments. The result from flat-flame burners could hardly be otherwise; for the source of light being as a rule above the head-line, and the radiation of light being chiefly outwards and upwards, the greatest brilliancy is thrown on the ceiling, where it is least required. The public had got so accustomed to this rather pleasing effect to the upward eye, that for a time the chief objection to regenerative lamps was that the ceiling was left in shadow. But for practical purposes that seems rather an advantage than otherwise; the light being thrown down, where it is most wanted. I hope to show that in all cases where it is essential to light up decorated ceilings, this may be done by the use of non-ventilating lamp groups.

In this age of sanitation, when gas-lit rooms come under the bann, it is our duty to show that, while gas may be an active means of vitiating the atmosphere when combustion is imperfect (just as candles and oil-lamps, only in a lesser degree), improvements have been made towards the perfecting of combustion by means of the regenerative burner. It requires no demonstration to show that, if equal light can be got for half the gas consumption, the vitiation of the atmosphere is greatly minimized, and it becomes apparent that if the source of light is close to the ceiling in ordinary rooms, and as much as 15 to 20 feet from the floor in larger apartments, the living conditions must be healthier in a corresponding degree.

So much may be claimed for the ordinary non-ventilating type of lamp which discharges the minimized products of combustion near the ceiling. But so little are the laws of gas-burning understood by the public, that it is a common experience to find consumers who have tolerated, without question, the vitiated atmosphere of a gas-lit room with flat-flame burners consuming 30 cubic feet per hour, raise the question as to ventilating tubes being required when a regenerative lamp burning 12 cubic feet an hour has been suggested instead. The funnel-shaped exit of the lamp suggests that there is something to be got rid of; while it has never occurred to them that steps should be taken to remove the products of combustion from burners imperfectly consuming almost treble the amount of gas. It is true that thermometrically a room lit by non-ventilating regenerative lamps may be warmer in the vicinity of the flame than within the same distance of a gasalier; but the objection to gas-lit rooms is not due to their thermometer heat, but to the vitiation of the atmosphere and consequent feeling of oppression, which state of things is absent when a non-ventilating regenerative lamp is in use.

As a case in point, permit a personal experience. I usually sit under a lamp of this type, burning 9 cubic feet per hour. The light is brilliant, and the atmosphere cool and pleasant for hours together. If an adjournment is made for an hour or two, to another room in which some 20 cubic feet of gas are consumed by Peebles governor burners, the atmosphere becomes oppressive, and it is a relief to return to the cheering beams of the regenerative lamp. This is a fair comparison between the very best type of flat-flame burner and an approved form of non-ventilating lamp.

The merits of regenerative lamps as a combined lighting and ventilating apparatus cannot be too well known. So efficient are they in this respect that plants and flowers may with safety be left in such rooms, while the injurious effects of gas burned in the ordinary way is proverbial. Efficiency cannot, however, always be guaranteed, owing to the faulty conditions which prevail. There is the difficulty of getting access into the proper chimney, and the uncertainty of a good up-draught in any case. When rafters and angles prevent connection with the chimney of the room in which the lamp is to be fixed, flue-pipes are sometimes led into an adjoining flue; but this is to court failure, or attain an accidental success. There is also the not uncommon difficulty of securing an efficient fresh-air ingress to the room, which is as essential as a good outlet.

A case in point may illustrate this. Ventilating lamps were wanted in each of two adjoining rooms of equal dimensions, and apparently similar conditions, with easy access into each chimney and a good up-draught. One lamp burned perfectly, and proved an efficient ventilator; while the other refused to do either. Of course, the lamp was condemned; and it was vain to point to the efficient lamp in the next room, and to suggest that fresh-air ingress was deficient. This was easily proved by merely leaving the door ajar, or the window slightly open; and it led to the adoption of fresh-air intakes with the desired effect.

So problematical is the success of connecting ventilating lamp flue-pipes with coal flues, that it seems better (where this is possible) to carry separate flue-pipes to discharge above the roof. But then, as always, it is necessary to pack the flue-pipes in their whole length, and to use an exhaust ventilator double-cased and packed in the same way. Otherwise the best ventilator will (under certain conditions) act as a refrigerator and prevent the exit of the heavier gas.

Objection is taken to the trouble involved in the use of regenerative lamps; but if properly fitted and attended to, the trouble is almost *nil*. If users will not keep the glasses clean, nor look to the burners, disappointment must follow. The trouble lies less in the lamp than in its accessories; though in several respects these have been simplified. The lamps, too, are held largely responsible for blackened ceilings. But the risk is greatly exaggerated; and when the lamps burn in a normal condition, there is no more (but probably much less) carbon deposit, than from open-flame burners; and while in the latter case the carbon particles float in the air high and low, with regenerative lamps, the evil, if any, is concentrated, and the particles are projected on to the ceiling, where they can do least harm. And yet it is true that the charge of blackened ceilings against both systems is unwarranted. Some years ago Mr. Sugg conclusively showed that "the ceiling discoloration arises from the state of the atmosphere, which, in large towns, is largely mixed with heavy smoke particles, and from the dust and dirt created in rooms by the use of coal fires, as well as from the smoke which more frequently than is supposed, escapes from the fireplace into the room." A regenerative lamp being a greater heat-centre, and closer to the ceiling than the ordinary gasalier, does of course attract these floating particles, and by its heat transfixes and discolours the deposit—in which, however, there may be no trace of carbon.

In one case, a professional friend—satisfied in all other respects with his lamp—complained of it smoking the ceiling, and wished it removed. On close inspection, it was made quite clear that the discoloration was due to dust particles which (in the process of cleaning the room and otherwise) had been drawn into the heat zone, and found rest on the surface of a heavy and porous ceiling-paper. In an asylum dormitory lit by regenerative lamps, a like complaint was made; and what to all appearance was a badly smoked ceiling, showed simply a deposit of "fluff" on a varnished wood ceiling where shaking bedclothes had whirled the loose particles within the heat radius of the lamps.

There are, of course, abnormal cases in which a brilliantly lit room may, by the failure (from one cause or another) of the lamp regulator, be transformed into a carbon manufactory; and while the cause of failure may be so explained, this is a very serious defect, and is really *the* weak point in regenerative lamp lighting. It is hopeless to argue with a consumer that it may be worth while to run the risk of an occasional blackened ceiling in view of other compensations; and it is idle to suggest (when this happens) that the failure is due to the accidental upsetting of a nicely adjusted scientific instrument which is not as yet infallible. You have in this Association an esteemed member, who perhaps has done more than any other man to perfect this instrument; and it is no derogation to him when I say the unfailing regulator has not yet been devised. Until he or some compeer shall invent a regulator at once simple in its construction, free in its working parts, easily accessible, and unfailing in its action under ordinary conditions, the chief obstacle in the progress of regenerative gas lighting has still to be overcome.

The matter of efficient control is much simplified when (instead of a single lamp, which has to be attached to existing fittings) a complete installation is to be fixed on one range of pipes. It is then possible to secure practically unerring control, by the use of an improved make of mercurial pressure governor fixed conveniently on the supply-pipe. The governor may be loaded to the required pressure, and the volume of gas adjusted by regulating screws fitted in the key-plugs of each lamp-tap. Here, there is no risk of failure, as in volumetric regulators which are "adjusted to finer issues," and more liable to local disturbance. These mercurial governors should be locked and sealed, to prevent

ignorant interference with the conditions of pressure. The advantages underlying this method of controlling pressure and volume, have made easy the problem of lighting large interiors. In the earlier stages, this was made impracticable by the method of leading separate pipes to each lamp, and the fitting of regulators on each ascending pipe. It was then usual to keep each lamp burning with a bye-pass flame, which in large lamps consumed about 2 cubic feet of gas per hour. Suppose twelve lamps fitted in a public hall, each consuming 15 cubic feet per hour, and that the lamps were used two hours nightly for a week. The consumption during fourteen lighting hours would be 210 cubic feet, while the gas consumed on the bye-pass during the 140 hours the lamps were kept ready for use, would be 280 cubic feet, or one-third more than the cost of gas for lighting purposes. To prevent this prodigal waste, pilot lights burning 1-10th of a foot per hour were introduced, and should be universally adopted.

In accordance with the sub-title of my paper, I now proceed to describe alternative methods by which regenerative lamps may be applied with success to the lighting of large interiors. In such buildings the advantage and superiority of regenerative lamps when effectively distributed become apparent—not only on the score of economy, but of atmospheric conditions, and because of the steady and brilliant effect unattainable by any system of flat-flame burners.

The first to be described is a form of ceiling light for a private room 35 feet by 25 feet. The object here was to hide the outline of the lamp-shafts and to fix the lamps close to the ceiling in one cluster, rather than from three centres. The ceiling plate (4 feet in diameter) was covered with asbestos cardboard to prevent any heating of the floor above. The lamps depended from one fixing-plate, to which the three lamps were connected. The bottom disc was connected with the ceiling plate, and admitted the lamp shafts and body—showing only the lamp rims and glass shades underneath. The construction was concealed by a series of large metallic leaves surrounding the lamp cluster, which may be decorated in keeping with their surroundings and removed separately for repairs. The gas supply is controlled in the method I have already described; and the lamps may be cleaned from ordinary step ladders.

Another method of lighting a similar room was shown in operation in the meeting-place. This three-lamp cluster was simply fitted in the place of a gasalier temporarily removed. There was no attempt to disguise the lamp-casings, which were pendant from three iron tube arms with wrought-iron scroll-work. This group was fitted for conditions where wall taps and a pressure governor cannot be applied. Above each lamp there was a down-current regulator adjusted to pass 9 cubic feet of 25-candle gas at any varying pressure. Each lamp was fitted with a lever tap having a pilot-tube bye-pass attached. In the first instance the three lamps were arranged to be controlled by one tap. In this cluster as shown, however, one or more of the lamps could be lit as required. This style of pendant is well adapted for the lighting of large interiors; for such clusters are at once more effective, and less distracting to the vision than a scattered constellation of single lamps, while the fitting is greatly simplified.

A large installation of this kind has just been accomplished with complete success, where the problem was to light a Drill Hall having a lofty open roof and absorbent brick walls; the floor space measuring 137 feet by 87 feet. An unsuccessful attempt had been made to light this spacious interior by four sun-burners, consuming some 300 cubic feet of gas per hour at 1 inch pressure. These have been superseded by twenty regenerative lamps, consuming in all 260 cubic feet per hour; and these are disposed in five pendant groups fitted 16 feet above the floor-line. The lamps are controlled by one mercurial pressure-governor and adjustable taps. Each group is fitted with a tap in the down-rod; but the twenty lamps may be lit simultaneously by a controlling tap. Pilot lights are fitted to each lamp; and these do not in all burn more than 2 cubic feet per hour, costing less than 9d. per week. The result is an entire absence of shadow on the ceiling, and an equal distribution of powerful and well-diffused light.

I now call your attention to an arrangement (illustrated by a wall diagram) for which entire novelty, and some credit, may perhaps be claimed. It is a common difficulty in dealing with large and lofty interiors, to devise an effective lighting scheme, at once easy of manipulation and free from the foul and flickering effect of masses of open jets so often resorted to on the score of cheapness and simplicity. I have shown that in limited as well as spacious apartments, where pendant groups may be reached with step ladders, regenerative lamps can be used with advantage. But in halls say 40 feet to 50 feet high, with or without galleries, these are not always suitable. The drawing showed how the difficulty may be overcome, in buildings where there is a height of four feet or more in the ceiling loft. The problem of which this is a solution is to arrange one or more lamp groups so that the globes shall be just under the ceiling line, with one central lamp somewhat lower. The lamps must be accessible from the ceiling loft for cleaning purposes, and sustained in position during that operation or when in use. This is accomplished by the device of a double-limbed arrangement of gas-pipes (one carrying the supply of gas to the burners and the other to the pilots), and these limbs are attached to strong plate-joists fixed to the ceiling joints. At the moveable ends of the limbs, strong swivel-joints connect to cross arms, on which the lamps are fixed by suitable attachments to centre points as required; the pilot supply following the same course. The whole apparatus in front of the fixed swivels is attached by steel-wire rope to a pulley in the cross beam, and connected to a special form of self-sustaining hoist, by which the lamp group may be raised or lowered at will without disconnecting any part of the attachment. The ceiling plate is bolted to a strong wrought-iron frame, set on edge and securely fixed to suitable bearers, so that the attendant may (if required) get under the lamp group when raised for cleaning. Similar lamp groups to this have been fitted in several large halls, from 40 feet to 50 feet above the floor-line, and they are under specification for the lighting of a city church.

It may be suggested that there must be a great loss of light when the lamps are fixed 50 feet above the floor-line; but one cannot apply the same rule here as in open-flame burners, and the result is the best answer to that suggestion. In the first installation under this system, it was stipulated that the lamps used should give a light at least equal to three large sun-burners (which in actual use consumed 800 cubic feet of gas per hour) at a greatly reduced cost. Three lamp groups of twenty lamps in all, consuming 260 cubic feet, were employed. The following extract from the official report to the shareholders of the hall in question is the best commentary as to the result:—

"These lights have met all the expectations formed of them. The hall is better lighted even than before, and with a very large saving of cost during the short time the new system has been in use. The Directors confidently look to a considerable reduction of expenditure on this head in future."

After fifteen months' trial, the Chairman, in submitting the report for the following year, said:

"The adoption of the lighting system had produced the substantial saving in the expenditure which was anticipated when it was introduced. The expense of gas in the previous year was no less than £135, and for the past year it was only £91, which, he thought, was a sufficient proof that they were right in going into the expenditure."

Apart from the effective and economical features of the system, and the ease with which these lamps may be manipulated, it will be apparent that a distinct gain in the matter of ventilation is secured. The ceiling plate is perforated; and the heat of each lamp is utilized in extracting the vitiated atmosphere into the ceiling loft, while the products of combustion discharge above the ceiling. It may be objected that this arrangement does not permit of ventilating tubes being led from each lamp group; but to connect the lamps in any such way would simply be to court failure. The better plan is to arrange an independent scheme of ventilation, and this has been done successfully in several of the halls referred to. An indirect advantage of discharging the heat products from the lamps into the ceiling is that the ventilating shafts in the loft are in the vicinity of artificial heat, and are the more likely to act efficiently.

In conclusion, I trust that in stating the case for regenerative lamps I have managed to steer clear of controversial matter as it affects competing lamp patents; and while I shall not (if challenged) be slow to state reasons for the faith that is in me, in my unwavering attachment to a certain type of lamp which shall be nameless, I feel sure that you will approve my desire to limit the discussion to the system of regenerative lighting generally and to its particular application. May I hope that its interest will be none the less on that account, and that some good purpose may be served by the discussion of a subject to which I have devoted not a little attention. I court the frankest criticism, and shall be happy to make myself plain on any point on which I may not have made my meaning clear.

Discussion.

The PRESIDENT suggested that, as the time for adjourning had arrived, the discussion on the paper should be postponed.

Mr. J. M'GILCHRIST (Dumbarton) moved that the discussion be delayed until the next conference.

The PRESIDENT said he thought they should accord their hearty thanks to Mr. Macfie for his very excellent paper.

Mr. J. M'CRAE (Dundee) did not consider it wise, in an assembly such as theirs, that trade business should be discussed. He said he spoke in all kindness, and in deference to the writer of the paper; but he thought it ought to have been submitted to the Committee before it was read. In his opinion, they ought not to criticize trade business of any kind whatever.

Mr. D. M. NELSON (Glasgow) said there was nothing at all new in the paper. There were several descriptions of regenerative lamps, but nothing novel submitted.

Mr. MACFIE said he was in the hands of the meeting. He had come prepared for the discussion of any part of the paper; but he waived this entirely. He read the paper by the invitation of the Association; and he thought he had avoided everything of a trade nature.

The PRESIDENT did not consider it was right to bring up this point at all. If they invited gentlemen to prepare a paper, they should listen to it.

Mr. D. BRUCE PEEBLES thought it was unfair to Mr. Macfie to continue the discussion when he had no right of reply. Mr. Macfie had given the meeting a very excellent paper; and he complimented him upon it.

It was eventually agreed, as already reported, to make the discussion of the paper the first business at the next meeting.

PARLIAMENTARY INTELLIGENCE.

PROCEEDINGS ON BILLS DURING THE PAST SESSION.

Last Wednesday, the remaining Bills in which our readers are interested—viz., the Bognor Water Bill, the Electric Lighting Orders Confirmation Bill (No. 10), the Keighley Corporation Bill, and the Local Government Provisional Orders Bill, No. 14 [Salford Order]—received the Royal Assent; and Parliament was prorogued by Royal Commission to Oct. 20 next.

The following is a list of the Private Bills of which the progress was recorded in the JOURNAL from week to week during the past session: Alloa Water Bill; Barmouth Local Board Bill; Bognor Water Bill; Brentford Gas Bill; Bristol Gas Bill; Croydon Water Bill; Dundee Water Bill; Falmouth Water Bill; Filey Water and Gas Bill; Fylde Water Bill; Garw and Ogmore Gas Bill; The Gaslight and Coke Company Bill; Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Bill; Keighley Corporation Bill; Kettering Gas Bill; Leighton Buzzard Gas Bill; Llanelly Local Board Water Bill; Malvern Water Bill; Market Drayton Water Bill; Mountain Ash Local Board Bill; Nelson Corporation Bill; Newark Corporation Bill; Northallerton Water Bill; Penmaenmawr Local Board Bill; Rhyl Gas Bill; Southwark and Vauxhall Water Bill; Stourbridge Gas Bill; Stourbridge Improvement Commissioners' Bill; Sunderland and South Shields Water Bill; Troon Water Bill; Western Valleys (Mon.) Water Bill. Of the 31 Bills in the preceding list, all were passed except the Brentford Gas Bill, the Croydon Water Bill, The Gaslight and Coke Company Bill, the Nelson Corporation Bill, and the Troon Water Bill, which did not reach the final stage.

HOUSE OF COMMONS.

Monday, Aug. 3.

LONDON WATER COMPANIES' RATES.

Mr. HOWELL asked the President of the Local Government Board whether his attention had been called to the fact that the East London Water-Works Company, and other London Water Companies, had been charging on the new assessment, which came into force in April last, increased rates for the three months preceding the date of that assessment; and whether the demand for this increase was legal.

Mr. RITCHIE: I have communicated with the East London Water Company on the subject of the question. I understand that it has been the practice of the Company to make their rates half yearly—one quarter in arrear and one quarter in advance—upon the valuation in force at the time the rates are made, instead of making and collecting them quarterly in advance as they are entitled to do. The effect of the practice is, of course, to anticipate by one quarter the effect of a new valuation list, whether as regards increases or decreases of assessment. I have no authority to determine whether or not the practice is legal. But the Company are in communication with their legal advisers; and I have received an assurance that if, in the opinion of those advisers, the practice is erroneous in point of law, the Company will at once take steps to return any sums which may be found, in consequence, to have been overpaid.

Mr. HOWELL asked the right honourable gentleman whether he thought it right or legal that, as the Company collected the money half yearly, they should charge consumers on the quarter preceding the period when the new assessment came into force.

Mr. RITCHIE: If the honourable member asks my own opinion, I should say it was neither right nor legal.

At a later period of the sitting,

Mr. CREMER asked the President of the Local Government Board whether he was aware that the New River Company were demanding from persons whom they supplied with water a quarter's water-rate in advance, and that this demand was made even upon persons who had regularly paid their rates for 20 or more years; whether he could state the amount which was thus being added to the capital of the Company; and, if the action of the Company was strictly legal, whether the Government, on the grounds of equity, would consider the necessity of introducing a Bill or taking any other steps to compel any water company exacting such advance payments to pay to every person from whom they thus obtain deposits a fair rate of interest thereon.

Mr. RITCHIE: Section 70 of the Water-Works Clauses Act, 1847, which is incorporated with the New River Company's Act, 1852, provides that water-rates shall be paid in advance by equal quarterly payments. The section has almost invariably been incorporated with Local Acts or Provisional Orders, by which local authorities or water companies have been authorized since 1847 to make charges for the water supplied by them. It is also incorporated with the Public Health Act, 1875; and therefore applies to cases where water is supplied by sanitary authorities under the general law. The effect of the payment of the water-rates quarterly in advance cannot be to add to the capital of the Company, as the rates are applicable as revenue. The right to claim payment in advance must be presumed to have been considered when the rates were fixed; and I cannot give any undertaking to propose the legislation suggested.

Mr. CREMER asked whether it was contemplated, by the Acts to which the right honourable gentleman referred, that householders of 20 and 30 years' standing, who had never been defaulters, should at the end of that time have a quarter's rate demanded in advance.

Mr. RITCHIE said he did not understand the meaning of the expression "at the end of that time." Undoubtedly the Acts in question entitled the Companies to charge a quarter in advance.

Mr. CREMER said that in many instances a demand had now for the first time been made upon householders of 20 and 30 years' standing, without being defaulters, of a quarter's rate in advance.

Mr. RITCHIE said he had no information as to why the Company should now for the first time avail themselves of their rights under the Acts; but undoubtedly they possessed the power to demand a quarter's rate in advance.

LEGAL INTELLIGENCE.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Thursday, July 30.

(*Before Sir* P. H. EDLIN, Q.C., *Chairman, and a Bench of Magistrates.*

The Gaslight and Coke Company's Assessment Appeals.

(*Continued from page* 216.)

The Counsel named last week appeared for the various parties. In addition, it should be mentioned that Mr. CORBET WOODALL and Mr. H. E. JONES were retained for the appellants; Mr. W. A. VALON for the City of London, the City of Westminster, and the parishes of Hackney, Kensington, Shoreditch, Bethnal Green, St. Giles's, and St. George's Bloomsbury, and Mr. W. R. CHESTER for the Islington Vestry.

Mr. *G. F. L. Foulger*, examined by Mr. LITTLER, said he was Chief Inspector of The Gaslight and Coke Company, and had had 30 years' experience with regard to the distribution of gas and main service laying. He had prepared detailed lengths of the various sizes of mains used in each parish, whether or not they were wholly or partially supplied with gas by the Company. With regard to the City, in St. Alban's, Wood Street, they had 86 yards of 3-inch productive mains, and 172 yards of 4-inch, 90 yards of 6-inch, 200 yards of 8-inch, 196 yards of 10-inch, and 196 yards of 12-inch non-productive mains. The productive mains were those which were tapped for services within this particular parish; the non-productive ones, those which ran through the parish, but were not tapped. Supposing a high-pressure main was not tapped, as the ordinary low-pressure mains were, by a number of service-pipes, but was simply a conduit into low-pressure mains, he would not deal with that main as being indirectly productive. There was no connection between the high and the low pressure mains. He had very carefully prepared returns of the mains laid and taken up, and also of another set of mains which were called "dead" pipes, which had been abandoned and left in the soil. Before the mains were laid in a parish, the officers under him supplied him with sketches as to the proposed size, length, and so on, to guide him as to the probable consumption; and they were from time to time carefully measured and checked, for the purpose of making the returns, and of knowing where they were, as well as for checking the contractors' accounts. The total length of productive mains of all sizes in the City parishes was about 67 miles; the pipes varying from 3 inches to 36 inches in diameter. The length of unproductive mains, leaving out those which had been discarded, in the City was about 4 miles. In the parishes outside the City, the total length of the productive and unproductive mains would be 1800 miles. In Marylebone, the size of the productive mains varied from 1½ to 36 inches; and the total length was 190,281 yards. There were no unproductive mains in the parish. In St. Pancras, the size varied from 1½ to 36 inches; the length was 285,223¾ yards; and there were no unproductive mains. In Bloomsbury, the mains varied from 3 to 48 inches (the latter being a carrying main), and 26 inches for a feeding main; length, 20,898 yards of productive, and 2252 yards of unproductive mains. In St. Leonard's Shoreditch, the productive mains varied from 1½ to 24 inches; and the total length was 150,697 yards; the unproductive mains ranged from 12 to 36 inches, and their length was 7667 yards. In St. John's, Hampstead, there were no unproductive mains; and the productive ones varied from 1½ to 24 inches, and their total length was 154,463 yards. In Paddington, there were also no unproductive mains; the sizes of the productive ones being from 1½ to 26 inches, and the total length 145,329 yards. In the Hackney Union, there were productive mains varying from 1½ to 48 inches in diameter, and having a total length of 295,265 yards; the unproductive ones (48-inch only) were 5550 yards in length. In St. Mary, Islington, the productive mains ranged from 1½ to 36 inches, and their total length was 373,487 yards; the unproductive mains (48-inch) were 3193 yards long. In St. George's Southwark, the productive mains varied from 1½ to 12 inches in diameter—ther total length being 7425 yards; and there were no unproductive mains. in Chelsea, the productive mains varied from 2 to 36 inches; total length, 82,573 yards; unproductive mains, 36-inch only, 4649 yards in length. In Stoke Newington, the productive mains were 1½ ro 18 inches in diameter, and 59,737 yards in length; there were no unproductive mains. In St. Martin's-in-the-Fields, the productive mains ranged from 2 to 36 inches, with a length of 38,930 yards; the unproductive mains, 36 to 48 inches, with a length of 1952 yards. In St. Clement's Danes, the productive mains ranged from 2 to 30 inches, with a length of 1060 yards; the unproductive main was a 36-inch, 495 yards long. In St. Mary-le-Strand, the productive mains were from 2 to 30 inches, with a length of 3664 yards; the unproductive ones being 36-inch, with a length of 203 yards. In St. Paul's, Covent Garden, the productive mains ranged from 2 to 12 inches, with a length of 7662 yards; and there were no unproductive mains.

The CHAIRMAN remarked that this examination was "dragging its slow length along;" and he asked if the particulars being furnished had ever been required of the Company. He apprehended that, if they had been, the Company would have supplied them.

Mr. LITTLER said they would have been furnished with the greatest possible pleasure. After this observation, he would not proceed further with the examination, but would leave it to the respondents to see if there was any inaccuracy in the figures which had been given.

Cross-examined by Mr. POLAND: With reference to the City parishes, neither St. Peter-le-Poor, Holy Trinity-the-Less, nor St. Botolph, Aldgate, had any non-productive mains. St. Mary, Cole Abbey, had 126 yards of 24-inch unproductive mains; Christ Church, Newgate Street, 397 yards of 30-inch; All Hallows, Lombard Street, none; St. Bartholomew-the-Great, none; St. Mildred, Poultry, 156 yards of 24-inch; St. Mary Bothaw, 68 yards of 24-inch; Great St. Mildred, Bread Street, 174 yards of 24-inch; St. Michael's, none; St. Mary, Aldermanbury, none.

Mr. POLAND said it was necessary that his Worship should have on his notes the particulars of the unproductive mains, because the parishes in which they were, were entitled to have their proportion of the value upon them. With regard to the productive mains, the parishes had their proportion according to the gross receipts therein.

In the tabulated statement of the appellants' case, although it professed to give, in several instances, the indirectly productive mains, they were omitted in other cases.

The CHAIRMAN said they could not make the net receipts serve a double purpose. If the parishes in which there were unproductive mains claimed a rateable value in respect thereof, and the appellants had not tabulated this rateable value, but had put it only where the mains were productive, they would have to amend it in order to give a proper value to the productive mains; but this would not alter the general total.

Mr. CASTLE said the respondents should have every halfpenny they were entitled to for the unproductive mains. He could not say anything fairer than that.

Cross-examination continued: He had adopted the same system with respect to productive and unproductive mains both inside and outside the city, and the same with regard to low-pressure and high-pressure mains—making no distinction between them. The latter were carrying mains in every sense of the word, except that they were used for taking gas from station to station at a higher pressure than the other mains.

Mr. POLAND: If there is a carrying main for the purpose of taking gas through to other parishes, and there is a branch main put on to take some gas away from the larger main, I suppose you call that unproductive?

Witness: Certainly, if there are no services.

I shall want the expenses of laying these unproductive mains. What is the cost of the different sizes?—Of course, it varies very considerably according to the class of pavement.

The CHAIRMAN: Do you ask for the cost of the conduit-pipe before it is put down, or the cost of laying it down? because the latter will vary according to the place where, and the depth at which it is laid.

Mr. POLAND said he wanted to know the cost of putting in the pipes, including the pipes or mains themselves.

Witness said he could give this, but not then. The largest size main tapped for house service was 48 inches in diameter; but there was only a short length of this size. They tapped the 36-inch, the 24-inch, and all the intermediate sizes. The average age of the mains in the City was 50 years; and to give the cost of laying the mains, &c., would necessitate going back for this period.

Mr. POLAND intimated that he would get the structural value from the Engineer.

The further cross-examination of the witness was postponed.

Friday, July 31.

Mr. *J. W. Field* was re-called, and further examined by Mr. CASTLE with reference to the sliding scale and its effect on the dividends of the Company. He explained that the standard price allowed to be charged was 3s. 9d. per 1000 cubic feet; but for every 1d. decrease, an extra ¼ per cent. dividend might be paid to the shareholders. For the last 2½ years, in order to pay the dividend, the Company had been obliged to draw upon their reserve fund to the extent of £610,000; and there was now only £232,000 left in the fund.

The CHAIRMAN: Have the shareholders the right to refuse their assent to the reduction of the reserve fund for the purpose of maintaining or increasing their dividend?

Witness: The shareholders may decline to pass the dividend.

The CHAIRMAN: They may think it more to their interest to decline to assent to the reduction of the reserve fund.

Mr. CASTLE: Then the shares would fall. (To witness:) You could not afford to draw from the reserve fund as you have done much more than a year.

Witness: No; at the present rate, we could not.

Certain documents which were asked for on the previous day were then handed in. The first was a statement of gross profits for the years 1889 to 1891, and was as follows:—

Period.	Amount of Actual Gross Profit.	Amount of the Increase in the Price, 3d. per 1000 Cubic Feet.	Amount of Gross Profit, less the 3d. per 1000 Cubic Feet.	Amount of Reduction in the Gross Profits.
1889.				
June half year. . .	£520,204	—	£520,204	—
December half year .	450,919	—	450,919	—
For the year . . .	£971,123	—	£971,123	—
1890.				
June half year. . .	£330,696	—	£330,696	£189,508
December half year .	371,550	£109,767	261,783	189,136
For the year . . .	£702,246	£109,767	£592,479	£378,644
1891.				
June half year. . .	£380,726	£114,734	£265,992	£64,704
July 1, 1889, to June 30, 1890.	£781,615	—	£781,615	—
July 1, 1890, to June 30, 1891.	752,276	£224,501	527,775	£253,840

The next was a statement showing the net rateable value of the directly productive mains for 1889-1891. For the twelve months to June 30, 1890, which is known as the "account year," it was £113,667, or 4·84 per cent. on rentals; for the year 1890, £103,934, or 3·96 per cent.; and for the twelve months to June 30, 1891, £74,096, or 2·70 per cent. The next document showed the variations in the price of coal over six years, as follows: 1886—June half year, 13s. 4·77d., December do., 12s. 4·01d. 1887—June, 12s. 4·30d.; December, 12s. 2·58d. 1888—June, 12s. 0·07d.; December, 12s. 3·21d. 1889—June, 12s. 3·68d.; December, 11s. 9·79d. 1890—June, 14s. 7·37d.; December, 15s. 10·41d. 1891—June, 16s. 4·72d. Taking the complete year 1886, it was 12s. 10·56d.; and for the twelve months to June 30, 1887, 12s. 4·16d. For the year ended December, 1887, it was 12s. 3·46d. do. to June, 30, 1888, 12s. 1·29d.; for the complete year 1888, 12s. 1·63d. for the twelve months to June 30, 1889, 12s. 3·45d.; for the year 1889, 12s. 0·74d.; for the "account year" ending June 30, 1890, 13s. 2·78d.; for the year 1890, 15s. 3·02d.; and for the twelve months to June 30, 1891, 16s. 1·72d. A further table showed the rate of carbonizing wages for the year 1890 as 3s. 7·03d. per ton; and in 1888, as 2s. 8·48d. per ton. —a difference of 10·55d. between these periods. Calculated on the total quantity of coal carbonized in 1890, this is equal to £85,913.

Cross-examined by the SOLICITOR-GENERAL: The figures he had handed in, showing the gross profits, were taken from the published accounts of the Company, and had not been the subject of adjustment in any way. With reference to the item of £103,934 for the net rateable value of the directly productive mains in 1890, that was an estimate which be prepared on the same lines as his estimate for the "account year" with this exception, that he added to the profits of the year 1890, before arriving at the figure of £103,934, the value of the 3d. increase in the price of gas for the first half year of 1890. He had not only added what was the actual result from the rise in the price from July 1, 1890, but also what the 3d. increase would have given had it been made on the 1st of January instead of the 1st of July. The amount he had added in respect of this was £101,500.

The CHAIRMAN: Had you any increase in the price of gas during the five years immediately preceding July 1, 1890? Had you any occasion to alter the price at that time, or did it remain stationary?

Witness: The price of gas had been going down; it had been reduced from time to time.

Cross-examination continued: The amount of the directly productive mains was taken on the rentals. He arrived at the rateable value of the mains by the total rental in the parish; and the percentages he had given were upon the rental earned during the year. Before he arrived at the figure of £113,667, for instance, he had to make a deduction from the gross receipts in respect of the unproductive mains. In making this deduction, he took his figures from the Engineer's estimates; but those relating to the cost of coal per ton from June, 1886, he obtained from the published half-yearly accounts of the Company. They did not represent successive contracts with the same colliery, as the contractors varied from year to year. The Company bought all their coals delivered into their own trucks or dock.

The CHAIRMAN: And stacked?

Witness: No; we do the stacking ourselves.

Cross-examination continued: There had been no variation in what was charged for under the contract, with the exception of the coal dues, which, of course, had expired during the period. This had increased the price of coal. The figures he had given did not represent the price paid to the contractor. They represented, in addition, the lighterage of the coal from the sheds to the stations, and the wages paid for carrying the coals—first to the heap, and then to the retort-house. The abolition of the coal dues did not enable the Company to obtain their coals at a lower price.

The SOLICITOR-GENERAL: I do not know whether you have the materials before you, but I will take hap-hazard one half year—for instance, the June half of 1890. The price you give is 14s. 7·37d. What were you paying the contractor during the half year?

Witness: For the two half years of 1890, we were paying the Marquis of Londonderry 14s. 4½d. a ton. That was subject to an abatement of 1s. in respect of services rendered by the Company in unloading and metering.

So that the net payment to the colliery was 13s. 4½d., while the work that was done in unloading and metering was performed by your servants, and the wages would appear in the accounts?—Yes.

Then I suggest to you that if you take the accounts and the full figure of 14s. 4½d. as the price of coal, 1s. of that is taken twice over?—No; I do not see that.

If you put it that the Company have paid 14s. 4½d. to the colliery, and have done a shillingsworth of work also which is charged in the wages account, you are debiting the Company with 15s. 4½d.?—No; that is not so, because in the Company's accounts we charge the coal at the reduced price you have mentioned—13s. 4½d. But then we have to add to our coal account the wages paid for doing that service; and therefore, although we take off the shilling for the payment made to the contractor, we add it to the net price in the accounts, and by that means restore the 14s. 4½d.

Can you tell me what was the net amount paid for any half year to the collieries, and what was paid for unloading and metering? Take (say) the same half year, ending June, 1890?—We paid the contractors £762,086 for that half year, and the charge for unloading and metering was £62,601. The lighterage charge amounted to £16,641; and there is a small amount of £473 for fuel used. These figures made roughly £841,800 for that half year, representing 1,123,792 tons of coal. If you are going to use the figures for any other purpose, you may as well have them exact. We sold a small quantity of coal, for which we obtained 14s. 11¾d. a ton, which gives altogether for the coal account £841,353.

In your table you give 14s. 7·37d. as the price?—Yes; we have been dealing, of course, with the quantity purchased. Then there was an adjustment of stock. We brought forward stock on Jan. 1, 1890, at a much lower price; and this reduces the figure in the accounts to 14s. 7d.

As I am dealing with these figures, have you anywhere handy the stocks of coal at the beginning and end of these half years?—In June, 1889, it was 62,930 tons; in December, 100,474 tons; in June, 1890, 263,002 tons; in December, 352,965 tons; in June, 1891, 200,652 tons.

I should like to know at what price these stocks were carried forward?—I have given you the total of the stocks, but it includes common coal and cannel. On June 30, 1889, the stock was valued at 10s. 6d. per ton; in December, 1889, at 12s. 10¼d.; on June 30, 1890, at 15s. 5¾d.; and in December, 1890, at 15s. 7¼d. The stock on the 30th of June of this year was valued at 16s. 9¼d. per ton. It was charged at the price at which similar coal was purchased during that half year, including all charges.

Does the proportion of common coal to cannel remain pretty constant?—No; it varies. Cannel coal has been a very difficult thing to get lately, and at times we have been quite unable to obtain it. In June, 1889, we had 5501 tons of cannel coal; in December, 17,009 tons;

in June, 1890, 25,159 tons; in December, 6327 tons; and in June, 1891, 12,812 tons.

Is there any particular time of the year at which the stock is very high, and another time at which it is very low, or do the stocks vary according to the market?—We should have our highest stock of coal about November, and the lowest would be in April or May. The stock is heavier in the beginning of the winter than in mid-winter, because we are obliged to get such a large quantity of coal in hand for the winter's work. Speaking from memory, I think our stock in November st was 464,000 tons.

The CHAIRMAN: How often do you take stock?

Witness: Every week. In December we had a stock of 460,000 tons. Week by week the Engineer would go round and see whether his stock was anything like the book entry; and it would be measured up from time to time. On the 8th of May last the stock was 98,400 tons, or equal to four weeks' consumption; on May 15 it was 120,000 tons, or sufficient for 5½ weeks; on May 22, 141,000 tons, or enough for 7 weeks; on May 29, 162,000 tons, or 8 weeks; on June 5, 175,000 tons, or 8¾ weeks; on June 12, 195,000 tons, or 9¾ weeks; on June 19, 215,000 tons, or 10¾ weeks; on June 26, 230,000 tons, or 11½ weeks; on July 3, 24,000 tons, or 11½ weeks; on July 10, 262,000 tons, or 12 weeks; on July 17, 279,000 tons, or 12 weeks; on July 24, 292,400 tons, or 13 weeks; on July 31, 308,000 tons, or 12 weeks; on Aug. 7, 317,000 tons, or 11 weeks; on Aug. 14, 334,000 tons, or 11 weeks; on Aug. 21, 347,000 tons, or 11 weeks; on Aug. 28, 364,000 tons, or 10¾ weeks; on Sept. 4, 373,000 tons, or 10½ weeks; on Sept. 11, 385,000 tons, or 10 weeks; on Sept. 18, 398,000 tons, or 10 weeks; on Sept. 25, 408,000 tons, or 9⅞ weeks; on Oct. 2, 417,000 tons, or 9½ weeks; on Oct. 9, 432,000 tons, or 9¼ weeks; on Oct. 16, 438,000 tons, or 9 weeks; on Oct. 23, 436,000 tons, or 9 weeks; on Oct. 30, 440,000 tons, or 8½ weeks; and on Nov. 6, 438,000 tons, or 8¼ weeks. The circumstances of 1889 were entirely different from 1890. The change took place about the middle of the year 1889.

The SOLICITOR-GENERAL: Then I am afraid I must ask you to let us have the book. I am quite content to take these figures for my purposes, if you are. Can you tell me whether the stock was larger or smaller in 1889 than in 1890?

Witness: Smaller. You will see the stock at the end of June, 1889, was 62,000 tons, as against 263,000 tons in the year 1890. At the end of 1889, it was 64,000 tons, as against 274,000 tons in December, 1890.

You have given me the figures differently before?—I beg your pardon, 100,000 tons, as against 352,000 tons in the next year.

The CHAIRMAN: And we have 450,000 tons entered as the proper amount to be considered in respect of the tenant's capital. Your cross-examination, I suppose, was directed with reference to that item?

The SOLICITOR-GENERAL: It is directed with reference to that item, and also an amount which is included in the five-twelfths of the annual expenditure, which is also brought into the tenant's capital.

Cross-examination continued: The carbonizing wages are separated from the other wages in the published accounts. For the account year, they were 3s. 5·94d.; for the year ending June, 1891, 3s. 6·87d.; and for the year 1889, they were 3s. 0·67d. With reference to the taking of money from the reserve fund, it is entirely at the option of the Company. It is quite within the province of the shareholders to carry any amount to dividend, subject to its being less than that allowed by the sliding scale. I used the words "reserve fund" rather loosely this morning. I included in the amount I then gave not only the reserve fund but the reserve of undivided profits. It is a distinction without a difference; but I wish to mention it. They both constitute a fund from which money can be drawn for the purpose of making up the dividend. The reserve fund is accumulated profit which has been left in the cash-box, so to speak, to be used if it is wanted. There is another fund formed by the Company, called the insurance fund, the application of which is strictly limited to accidents. That fund now stands at £87,130; and it cannot be employed for the purpose of maintaining the dividends. A small item of £350 was charged against it in 1886.

The SOLICITOR-GENERAL: Have you any tabular statement of the payments made upon the Company's share and loan capital, and the profits actually earned, during the last few years?

Witness: No; I have no table.

The SOLICITOR-GENERAL then handed to the witness a table which the latter said he had not seen before; but he said there could be no difficulty in producing a corresponding one.

The CHAIRMAN remarked that it might be taken *de bene esse* to have been made out from the accounts of the Company.

The SOLICITOR-GENERAL then handed in the table, which he said might be considered as being correct, unless the appellants intimated that it was not. The figures were as follows:—

Year.	Dividends Paid on Ordinary Stock.	Paid to Shareholders, &c.	Profit Earned.
	Per Cent.		
1880	10	£800,669	£899,910
1881	11	838,421	909,545
1882	11	843,766	870,511
1883	11	888,344	953,565
1884	12	1,082,960	1,000,973
1885	12	983,486	930,771
1886	12	980,641	905,444
1887	12¼	994,337	1,172,689
1888	13	1,035,378	1,109,874
1888–89	13 and 13¾	1,055,948	1,064,166
Year ended June 30, 1890.	13¾ and 13	1,056,053	781,614

Witness was then cross-examined by the SOLICITOR-GENERAL as to the statistics presented on the previous day, to see for which he was personally responsible, and as to which he took Mr. Jones's figures. Witness said that, in making his calculation in respect to which he predicated the rent the hypothetical tenant would give, he took the full twelve months up to June 30, 1890.

The CHAIRMAN: No, it is not so; your own figures show the very contrary. For instance, with regard to the requisite stock of coal, you have carried out a figure which does not correspond with the price paid in the actual account year. You have taken 14s. 6d.; whereas 13s. 2¾d. is the amount. Hence the necessity for the questions.

The SOLICITOR-GENERAL: Your Worship has exactly caught the point which was in my mind. What do you say about that, Mr. Field?

Witness: I assume that the account year ending on June 30, 1890, is to be taken as the basis of the future operations of the Company during the quinquennial period.

The CHAIRMAN: Then you ought to have carried out 13s. 2¾d., instead of 14s. 6d.

Witness: I say it was the basis.

The CHAIRMAN: Not the actual figures; but the basis, subject to probable contingencies.

Witness: Subject to correction for contingencies—quite so.

The SOLICITOR-GENERAL: So that, in suggesting to the Court the amount properly chargeable in respect to the City of London as £24,000, you have considered the circumstances which occurred between the end of the account year and the month of April, 1891, in order to get at that rent?

Witness: That is what we have done; and I have considered all the circumstances that occurred during that period, as far as I could foresee them.

Was there not a very important circumstance before the end of the account year for which you have made no allowance—namely, the increase in the price of gas?—There is no allowance made for that, because the Court said that we were to take these figures as the basis of our calculation.

Excuse me for putting this to you, because you will see it in a moment, you may take the figures as a basis of calculation, and just alter them in reference to the circumstances which have happened before the time at which you were called upon to decide; or you may take the figures as binding upon you, not to be adjusted by reference to final circumstances?—Quite so.

In dealing with your tenant's capital, you have taken into account the circumstances which did happen after the account year?—To some extent we did; but only to some extent.

Is it not the fact that, in making this calculation, you have absolutely neglected the circumstance that in June, 1890, before the end of the account year, the increase in the price of gas was resolved upon, and that it came into force on July 1, 1890?—Yes.

You have made no adjustment for that?—No adjustment whatever for that.

The CHAIRMAN: Because the increase did not come into operation until the day after the last day to which the accounts had been made up?

Witness: That is so.

The SOLICITOR-GENERAL: I understand your reason; I only want to get the fact. Supposing you had felt yourself at liberty or felt yourself bound to take into account the effect of the rise of price, what extra receipts ought you to have credited for the year?

Witness: About £211,000.

In the account you have presented, there is an item for repairs of works and plant amounting to no less than £276,762 in the year, or 3·68d. per 1000 cubic feet. Besides this you have "repairs of mains, including the cost of replacing small mains by larger ones, £52,185;" and "meter and stove repairs, £67,615." I will leave out, for the moment, the meter and stove repairs; but you have about £330,000 in the year for repairs of works and plant and mains? Is the whole undertaking kept in constant and good repair, as far as it is possible to do so?—That is, of course, a matter about which I am not competent to speak. I am not an engineering witness; and I can only deal with the amount actually expended.

Is any part of the work done in the shape of repairs, and in the replacement of mains, charged to capital account, or is it all included in this profit and loss account for the year?—The repairs and replacement of mains, pure and simple, are of course always charged to revenue. The building of new places I quite understand would be charged to capital account.

With regard to the meter and stove repairs, are you able to divide the sum of £67,615 between those repairs. You have given us the sums separately that are written off as depreciation. Can you give us the sums separately in respect of the meters and the stoves?—They are separately entered in the half-year's accounts. The stove repairs came to about £37,500, and the meter repairs to about £30,000.

With respect to the £61,000 for cost of management, what are the items which go to make up that?—Directors and Auditors, £5900.

What is the main item in the £61,000, because it is a very large amount?—Salaries, £15,200; collectors' commission, £29,000; stationery, printing, and general charges, a little more than £10,000.

With regard to "parliamentary and law charges, £9690," do you know if this is an exceptional figure, or is it a fairly average one?—That is a little high; but I think you must take it as an average figure now.

What was the charge in the year which succeeded the account year?—£7700. In the year ending June, 1889, it was £2300; in 1888, £10,000; and in 1887, £3500. With reference to the annuities, £4921 is referable to those paid under Schemes of Amalgamation, and £8779 is for retiring allowances to people who have been actually in the service of the Company. With reference to the items in the tenant's capital account, it is a fact that the Company make weekly payments in respect to coal; and the payments from customers for gas commence about the end of April for the March quarter's account.

Can you give me, with regard to any year, the amounts received month by month? Beginning (say) with July, 1889, which is the first month in the account year, will you tell me what the receipts were month by month?—July, £101,280; August, £172,043; September, £111,846; October, £74,450; November, £158,355; December, £98,144; January, 1890, £137,755; February, £282,260; March, £221,930; April, £138,151; May, £322,322; June, £219,278. These refer to private lighting only.

The CHAIRMAN: Is it during the second month after the quarter that the payments come in in greater quantities?

Witness: That is so.

Mr. CASTLE: In the second and third months.

The SOLICITOR-GENERAL: I will not, for the moment, trouble you, Mr. Field, with the particulars referring to the public lighting, because it will not affect the point I am putting, which depends on the regularity of the coming in, and not on the amount.

The CHAIRMAN: I take it that you are upon the £50,000 as the necessary cash balance at the bank.

The SOLICITOR-GENERAL: That is so (to witness:) It is obvious, in looking at these figures, that the month immediately succeeding the quarter is not a month of large income. I want you to take one of the small months—I do not mind which it is. I will take April, £138,151. Can you tell me how the receipts came in week by week?

Witness: Up to the 16th of April we received £9340; for the week ending April 23, we received £54,330; and for the week ending April 30, £74,482. For the public lighting, the figures were £17,582 in April, £50,661 in May, and £19,235 in June.

Is it your practice to receive deposits from your customers in respect of gas to be supplied to them?—Yes; not universally, but only to a small extent. I cannot tell you the amount of deposit in hand at the beginning of each month during the account year, as I have only it quarterly. In July, 1889, it was £28,555; at the end of September, it was reduced to £28,255; the December quarter was increased by £58. These figures do not appear in the half-yearly accounts. We allow 5 per cent. interest upon the deposits.

Can you tell me the total receipts and the total outgoings per month? Is there an account which shows that?—The cash-book will show it; but I cannot give the figures off-hand, as I shall have to eliminate all payments of dividends, and things of that kind, which you do not want.

The next item I have to deal with is a very large one—viz., 450,000 tons of coal, equal to seven weeks' consumption. On what basis do you take that?—We found it was necessary last winter.

In the figures we have gone through to-day, the number of weeks' consumption varies from four to twelve?—According to the season of the year.

I see your statement is put in this way: "It is found to be absolutely necessary, by reason of the altered condition of the labour question, both in the mining districts and in London."—Yes; I thought your comment upon the figures I was taking for the account year was that they were abnormal, in consequence of the disturbance—not a temporary disturbance—of the trade which had taken place. The largest stock was in October last, which is outside the account year.

You go on to say that there was an actual stock of 464,000 tons of coal, equal to seven weeks' consumption; and yet by the middle of January the stocks at some of the stations were wholly exhausted. You were receiving coal during some of those weeks?—The coals were not coming in at all as we wanted them during those weeks. We were receiving them, but not in accordance with the required deliveries. We were having only a small quantity. Coal was deliverable from time to time under current contracts; but we did not get it, owing to the bad weather in the North, and the refusal on the part of the men up there to work. There were no absolute strikes, but restriction of output, as I understand it, and frosts and fogs in the Thames.

Those were things that made that period one of exceptional difficulty to you?—I cannot say exceptional. Frost and fog rule in the winter in the port of London.

But your illustration of the stock having so grievously fallen off between October and the middle of January is not a thing which happens every year?—Every year.

It is not a thing that disturbs you; you expect it?—It does disturb us very much, in this respect: We cannot provide against it except by having these large stocks of coal. I think 464,000 tons in October, 1890, is the largest quantity we ever had.

When you say that the stocks at some of the stations were wholly exhausted, there are some stations at which you manufacture very little gas, are there not?—During the winter we employ every station up to its full power.

In the middle of January in the present year, what was the quantity of coal you had in stock?—290,000 tons, sufficient for five weeks. Of course, it was not equally distributed over all the stations. That is not a matter of administration; it is the result of circumstances. It is quite impossible to send the coal from station to station.

I suppose you are able, in your contracts, to determine to which stations your coals are to be sent; and that is the way in which you feed them. Now you say that in the winter, when you are under the greatest pressure, you employ all your stations at their full power. At other times, do you make gas at Beckton and pump it to various stations?—Yes where there are mains equal to the work. But we have not mains capable of doing it between Beckton and most of the other stations.

Which stations do you feed from Beckton?—I think you must put that question to the Chief Engineer. With reference to the weekly consumption of coal, 464,000 tons for seven weeks would be an average of 66,000 tons a week. December and January are the times of largest consumption. In the week ending Jan. 15, 1891, it was 67,600 tons; in the week ending Jan. 1, it was 67,000 tons; and in the week ending Dec. 24, 1890, it was also 67,000 tons.

As to the stocks of coke, tar, liquor, and products, I will pass from those, for I do not think there will be any serious challenge. I will now go to the large item of £529,000, representing the five months' expenditure?—I take it as five months, because the four winter months (January to April) will be equal to five-twelfths of the entire year.

Suppose a tenant were to come in on the 1st of April in any year, do you suggest that he would require to have five-twelfths of his total expenditure in hand?—Yes. A tenant coming into this undertaking must be prepared to carry on the business during the heaviest part of the half year.

I put it to you that the figures you yourself have given show that there is a regular income to the tenant of this property during those five months?—Regular; but not equal.

I quite agree. Now you will admit, will you not, that whatever period of time is taken as that for which the tenant should prepare himself by bringing in capital, you ought to take not only the expenditure on one side, but the income that would accrue to him on the other?—Quite so.

Can you tell me what was the amount expended by the Company in the first four months (I will take your own period) of 1890. The total outgoings for the account year were £2,239,884. How much of that went out during the first four months?—In the month of January, in round figures, £330,000; in February, £242,000; in March, £265,500; and in April, £216,000—a total of £1,053,500. The income from residuals—coke, tar, breeze, and liquor—lumping them all together, was in July, 1889, £52,196; in August, £52,422; in September, £53,637; in October, £83,073; in November, £77,489; in December, £102,655; in January, 1890, £97,041; in February, £117,707; in March, £117,146; in April, £102,840; in May, £98,043; and in June, £74,708. This works out, for the half year ending December, 1889, to £426,472.

That gives an excess of £20,000 over the figures presented in your account?—Yes; because those figures include the prices received for manufactured products, and the amounts set forth in the half-yearly accounts give the net profit on those residuals. In order to work up our tar products to make them saleable articles, we spend something like £150,000 a year; and the same with regard to coke, in which we have to incur a large amount for wages. There is another reason for the variation; and that is that the figures I have given you represent the sales actually made, irrespective of the stock on hand at the beginning or end of the half year. The amount for the second six months is £607,485. Nearly half of the business in residuals, or about £450,000 a year, is credit. We get paid for the coke after the middle of the next following month. Coke supplied in January would be paid for between the 15th and 28th of February. The £529,000 also included the expenditure upon coal, which would be now about £1,500,000, five-twelfths of which would be roughly £500,000.

Let me point out to you that you have already, in the tenant's allowances, a sum of £326,250 in respect of the stock of coal. This makes an allowance for tenant's capital of upwards of £800,000 for coal?—That would be so. You must remember that the £800,000 is at a much lower figure in the tenant's capital. The £326,250 is calculated at the price of 14s. 6d. per ton; whereas the actual cost is 13s. 2¾d.

This makes it worse, instead of better. By taking these two items, you have claimed that the tenant should have 17½ per cent. upon two-thirds of the whole expenditure for coal during the year? Do you mean to suggest that this is reasonable?—Certainly.

Suppose you were to excise from the expenditure of the year the amount spent upon coal, that would leave this allowance a small one?—Yes; it would be £500,000 less.

You have included in the expenditure upon which you claim 17½ per cent. the repairs of the hereditament, have you not?—No; not the whole of them. I have deducted £65,000 from the total expenditure.

If you have the figures which show the constituent parts of the £529,000, will you give me those which represent the total sum on which the five-twelfths is taken?—I first of all take five-twelfths of the total expenditure, which amounts to £2,239,000; and from this I deduct £65,000 for a proportion (of which I know nothing) of wear and tear, which may not be properly allocated to the tenant. That is for landlord's repairs; and this figure I get from Mr. Jones. That reduces the total expenditure to £2,174,000. I must also explain that the total of £2,239,000 which you have there does not include the expenditure incurred in the manufacture of tar and residual products. Of course, in making up our accounts, we are bound by the forms of the Board of Trade; and they stipulate that the income derived from coke, tar, and liquor are to be given next—that is to say, after deducting the cost and charges for manufacture. Therefore the £2,239,000 is not really the total expenditure; but, as we have to incur the outlay on these tar products, I take one-twelfth of the amount so spent, which is £14,000. The actual sum expended in the year on those residuals is £166,000. We are supposed to get that money back in the following month by the sale of tar and other products; so I only take one-twelfth instead of five-twelfths. I give credit for five-twelfths of the residuals, which amount to £350,700. But inasmuch as we do not get all our residuals back for cash, I deduct from that (I am sorry to say it is rather a complicated story) three twenty-fourths, equal to six weeks' working, for the credit sales, which amount to £60,000; leaving the net credit for the residuals at £290,700. Then I also give credit for the payment received for gas, as far as I can estimate it, during the period covered by the five-twelfths—that is, £100,000. That gives a total credit of £390,700; and this deducted from £919,800 makes my tenant's capital £529,100. In dealing with this question, I have excluded all consideration of arrears.

Have you taken it, as I should suggest would be the proper way—there being arrears possibly on either side of the account—as if the incoming tenant would be entitled to all the receipts, and subject to all the payments that had to be made from time to time on his entrance?—I do not know. I do not think that is a question I can answer.

I think you can. I am not asking you as to the question of right, or whether or not it ought to be considered, as that would be a matter for discussion before the Court. But have you made your calculation on this plan—that the tenant comes in at a particular moment, and all the things received after that moment belong to him, and all the outgoings are to be paid by him? Is that the basis?—No; I do not know that it would make much difference, whichever way I took it, as the arrears would be so small. You must bear in mind that, if the tenant entered into occupation on the 1st of January, there would be the whole quarter's gas due, for which he would perhaps pay. You must look upon it as a clear tenancy from the 1st of January, apart from all question of incomings and outgoings of the past year. I have dealt with it as a clear tenancy.

Then have you excluded the sums that would be received during the first quarter of his tenancy in respect of gas supplied before that tenancy began?—Yes; because they do not belong to him. I have in no way mixed up the amounts received with the amount earned.

You have given us the amount of gas-rental for December, 1889, as £1,141,693. Is that figure taken from the accounts, and is it an amount which was actually received in that half year, or actually earned?—It is simply earned.

It is the value of gas sold and delivered within that half year; and the whole of it would be receivable by the tenant who was in occupation during that period?—Yes.

With regard to moneys received during the half year, which had been earned in the previous six months, have they appeared in the former half-year's account, and therefore do not enter into this account at all?—Yes. Referring to the general balance-sheet of December, 1889, the amount due to sundry tradesmen and others and for coal, stores, and sundries, represented a certain proportion which had been purchased during the previous half year. It would embrace the cost of the coal supplied during the last week or fortnight of the year, and also the stores bought during the previous month. In the capital account, the balance standing to the credit of capital was £302,000; the balance to the credit of net revenue which was available for dividend and also floating capital was £580,000—making £876,000. The dividend was paid in March, and amounted to £376,000.

That would leave you £500,000 of capital to go on with?—We had to go to our bankers to supplement our capital to the extent of £75,000 in January, 1890. In February we borrowed another £50,000; and both of these amounts were paid for at the end of February. Then in order to pay our dividend on the 1st of March, we had to borrow a quarter of a million, because we were short of capital. Our floating capital to-day is nearly a million of money—£986,786; and we cannot do without it.

You have taken 17½ per cent. upon the tenant's capital of £1,705,577. I must ask as to that, because it is challenged. Is that accepted by you simply as a traditional percentage, or are you prepared to allocate the 17½ per cent. to different causes, and to say what you think is due to each?—I would rather take the 17½ per cent. as the hitherto received amount.

You know that it has been customary to divide that, and to allot 10 per cent. for tenant's interest and 2½ per cent. for risks and casualties? Do you suggest that 10 per cent. is a reasonable percentage for interest?—I think so; especially just now, when there is so much competition.

Is not the effect of that competition to decrease the tenant's profits?—No; it is to increase the risk of the business.

Is not the effect of the change which has taken place in financial affairs for some years past to reduce the rate of interest that you can get for capital invested anywhere?—Yes.

This is a monopoly business?—It is no longer a monopoly of light, because the electric light is making, as you know very well, considerable strides over all our districts; in fact, some of the parishes are directly fostering that system of lighting. We have not yet felt the pressure of electric lighting to the extent we shall feel it.

Have you felt it at all?—Certainly; all the big hotels in the West-end are illuminated by the electric light. Our accounts indicate the extent of the pressure, as our percentage of increase has not been maintained. We should have a larger increase in our consumption of gas.

Your business is measured by the quantity of gas you sell; and that has extended?—Yes; by reason, to some extent, of the introduction and use of stoves for heating and warming. In the years 1881, 1882, and 1883, our increase was 4⅓, 4¼, and 4 per cent. In 1890 it was only 2½ per cent.; but in 1891 it has been 9·55, or nearly 10 per cent., owing to the enormous fogs during the winter. I have now before me the figures for the public lighting. In the month of July, 1889, the receipts were £23,845; in August, £20,986; in September, £7966; in October, £12,682; in November, £32,702; in December, £7666; in January, 1890, £28,067; in February, £39,829; in March, £18,325; in April, £17,583; in May, £50,660; in June, £19,235.

With regard to the renewal and insurance fund, which is put down at £141,583, where do you get that figure from?—From the engineering witnesses. I am not responsible for that figure; all I have done is to deduct 4·37d. per 1000 cubic feet, making £328,947, the actual money spent on repairs and renewals.

With regard to the rates, at 5s. 2d. in the pound, where do you get that from?—That is the actual amount paid in that year all over the district. In the City of London the rates are 4s. 10d. in the pound.

Mr. RYDE (for the parish of St. Luke's, Chelsea): There was one item mentioned by Mr. Littler, in his opening speech, of which I should like to know the importance. He said there were weekly payments now being taken by the Company for gas. Are those very appreciable items?

Witness: No.

Mr. LITTLER: I did not suggest that they were. I was only illustrating the competition of paraffin.

Mr. RYDE: The £28,000 deposited by the customers is something in the nature of tenant's capital provided by the consumers, is it not? It is capital which the Company can use for the purpose of their trade; it is in their hands, or to their credit in some form or other. Now, on that £28,000 the Company pay 5 per cent. interest?

Witness: We pay interest at 5 per cent.; but on the tenant's capital I charge, over the whole, 17½ per cent. in favour of the tenant.

Therefore the difference between the sum charged in your calculation and the sum actually paid for that £28,000 is 12 per cent.?—We are simply paying our customers 5 per cent. for money for which we should have to go to our shareholders.

Mr. RYDE: I only wished to point out that the witness calculates interest on tenant's capital at 17½ per cent., and that it is taken on three items on which the Company only pay 5 per cent.

Re-examined by Mr. CASTLE, witness said the Company were required by their bankers to keep an actual balance. They stipulated so recently as last year that £25,000 should be kept at the bank; the reason they gave being that the accounts were so very complicated—some thousands of small cheques being passed through in a year. He had not taken the price of coal on the ascending scale; for although 13s. 2d. a ton was the sum actually spent last year, the Company were now paying 15s. 0¼d., and he had estimated it at 14s. 6d.

Mr. CASTLE: You have been asked, if you go beyond the account year, and take into consideration the prospective rise in the price of coal, why you should not also go beyond it, and take into account the 3d. increase in the price of gas. If you had gone into that, would you not have had to take the extra expenses for labour and coals, which would have produced the result you have given to the Solicitor-General?

The SOLICITOR-GENERAL: I do not think Mr. Field would say that.

Witness: I do. You will find it in the statement I have handed in. If you had taken into account the increase in the price of gas, and the advanced price of coal, the result would have been that, instead of having a rateable value of £113,667, it would have been £74,096.

Re-examination continued: The floating capital of a million sterling includes all the elements of the tenant's capital. It includes the capital, at the present time in the bank, of £2000, the amount invested in coal and coke, tar, and stores. Tools and chattels do not form any part of the floating stock, neither do meters. In addition to the million, we should require £170,000 for tools and chattels, £275,000 for meters, and £275,000 for stores. That would bring it up to £1,720,000. With regard to the weekly stock of coal, although I have used the word "abnormal" as applied to the circumstances of the past year, I think they must look forward to it as permanent, especially taking into account the fact that the decision of the Court as to the assessment will be binding for five years.

The CHAIRMAN: You have laid stress on the probability (indeed, you said the certainty) of the ascending prices of coal. That being the chief material, your argument was based on that; and you ask us to accept an ascending scale in respect of labour and material upon which your business was founded. I think the time has now come for inquiring if you adopt that, and if that is the view you take—that during the quinquennial period upon which we have now entered, the ascending scale in the price of coal will prevail?

Witness: No; I have not taken the highest price for our calculation in any case.

You are aware that you have encouraged your shareholders to look for a diminution in the price of coal? Are you also aware that your Company have informed their shareholders that they would be subject to the high price under contracts subsisting in the present year?—Yes; and the figure I have taken in the tenant's capital is the actual price we shall pay under contracts into which we have recently entered.

I think the prospect held out is that it would be considerably lower?—Yes; and you will see that it is so. The price paid for the past half year is 16s. 4d.; and the figure I have taken into account in my tenant's capital is 14s. 6d.

The Court then adjourned till the following day, when Mr. Field was further examined. He was succeeded by Mr. H. E. Jones, who occupied the Court the remainder of the day, and also Friday last, when the proceedings were adjourned till October. This portion of our report will appear next week,

---

The Gas Question at Coventry.—On Monday, the 27th ult., the Coventry Town Council had a meeting in Committee to deliberate on the subject of the gas supply, in view of the recent revival (referred to recently in the JOURNAL) of the proposal to connect the gas-works with the Nuneaton Railway. This, as may be remembered, raised the question of erecting new works; and the result of the recent meeting was a decision to recommend the Council to authorize the Gas Committee to draw up a report stating what steps they consider should be taken to supply the city with gas, in view of the probable annual increase of 6 per cent. in the consumption for the next ten years.

New Joint-Stock Companies.—The Energy Gas, Electric Lighting, and Power Company, Limited, has been registered with a capital of £20,000, in £1 shares, to acquire certain patents relating to gas lighting, and to develop and work them, and to carry on the business of mechanical engineers, &c. Murgatroyd's Ammonia-Soda and Salt Syndicate, Limited, is the title of a Company formed with a capital of £125,000, in £100 shares, to acquire the undertaking of a salt manufacturer now carried on by G. R. Murgatroyd, at Middlewich, Cheshire, in accordance with certain agreements already entered into, and generally to carry on the manufacture of salt, soda-ash, or any other chemical products.

The Cost of Electric Lighting.—Last Tuesday, the *Pall Mall Gazette* quoted Mr. Preece's figures as to the cost of electric lighting, upon which we have lately had occasion to comment. They brought forth a letter from Mr. R. Cook, residing at No. 276, Strand, who wrote to the above-named paper as follows: "The experience I have had of the cost of electric lights, now for two years past, does not accord with the statements and figures supplied by Mr. Preece. When I had the electric light laid on first, the Company handed me a circular, in which they stated their charge would be 20s. per annum for 8-candle lamps, to be used not more than an average of three hours per day. Shortly after this, they declined to supply the light at a fixed charge at all, and required a meter to be used. With this the result of something under 100 lamps has been a cost of upwards of 10s. per lamp for each of the winter quarters and about 7s. 6d. for the summer quarters, or 35s. per annum for 8-candle incandescent lamps. If Mr. Preece's statement is correct that 10s. per annum is the usual price per lamp, why do the electric light companies refuse to supply at double that figure? Further, what becomes of the theory of 8s. 4d. per lamp per annum for private dwellings, where in winter they would be required six or eight hours per day? I shall be glad to show my accounts to Mr. Preece or any member of his audience, or to any other person interested in the matter."

Extensions at the Wigan Gas-Works.—At the meeting of the County Borough Council of Wigan last Wednesday, Mr. Gee moved that application be made to the Local Government Board for sanction to borrow £30,000 for the purposes of the gas undertaking. He explained, in answer to an inquiry by Mr. Eckersley, that the Gas Committee had power to borrow the £30,000 some time ago, and they were simply asking the Local Government Board to send down an Inspector to see what the money was required for. The money they were seeking sanction to borrow was needed for several extensions which had to be made for the further improvement of the gas undertaking. They had now spent between £11,000 and £12,000 in new works, sulphate works, smithies, and other buildings—and they were also extending their mains, which, of necessity, they were bound to do. He could not say precisely to what amount, but they had already overdrawn the previous consent for money; and this they wanted to repay. He thought that this was about the fullest explanation he could give. The Borough Treasurer informed him that they had laid out upwards of £20,000 already of the £30,000 they were seeking power to spend; so that, with the £20,000 already spent and the extensions now going on, the £30,000 would be almost taken up. Alderman Hopwood condemned the practice of spending money before they had borrowed it. The proposition was carried.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Chief Offices, Horseferry Road, Westminster—Colonel MAKINS, M.P., in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. Orwell Phillips) having read the notice convening the meeting, the report of the Directors, with those of the Chief Officials, and the accounts for the half year ending June 30, the principal portions of which were given in the JOURNAL last week, were taken as read.

The GOVERNOR, in moving the adoption of the report and accounts, observed that, with the exception of one or two slight points, the working expenses had been very much the same as they were in the corresponding period of the previous year. The comparisons were so close that it was hardly worth while going through them; but he had the figures before him, and he would be happy to furnish any information that might be required in answer to questions. They had spent upon capital account during the half year £185,479. Among the leading items of this outlay had been the purchase of land at St. Pancras. They had had the opportunity of exchanging with the Great Northern Railway Company some pieces of land, and of purchasing a small additional quantity. This had had the result of converting their leasehold property there into freehold; and it had also had this indirect advantage—that it would relieve them, to the extent of £1500 a year, of the necessity of maintaining the leasehold redemption fund. The expenditure on works had been principally—almost entirely, he might say—at Beckton and Kensal Green. At Beckton, gasholders had cost £22,000; purifiers, £27,000; retort-houses, £8000; oil-gas plant (which was a new item), £23,000; and sundries, £6000—making £86,000 expended for the half year at their Beckton works. This expenditure had been necessary through the great increase in the business of the Company. At Kensal Green they had spent on a gasholder £23,000; on purifiers, £13,000; on retort-houses, £12,000. This was in settings for the retort-house. The retort-house at Kensal Green had been built; but it had been totally unoccupied for some years. During the past year, however, they had been furnishing it and fitting it up; and it was partly used last winter, while next winter it would come into full use. They had also spent £7000 at Kensal Green on the coal-distributing plant, of which he spoke at their last half-yearly meeting, and which, he was glad to say, had proved to be a very great success. To those interested in the matter, he could not propose a more agreeable and interesting holiday than to spend an hour or two at Kensal Green, watching it in operation. This outlay, with sundries, amounting to £4000, brought the expenditure at Kensal Green up to £59,000; or a total, together, of £145,000. The expenditure on mains, meters, and stoves had been to meet the ordinary increase in their business. He did not think it would be necessary to raise any more capital during the year—or for a year to come, probably. Turning to the revenue account, the first fact which presented itself was the very remarkable increase in the sale of gas during the past half year, amounting to no less than 9·55 per cent. This was the most remarkable increase they had had in any one half year since he had had anything to do with the Company. It was due in a great measure to the dark and dismal weather which was experienced in the early part of the half year; but, as he pointed out on the last occasion, taking an average of years—going back six years—they found the increase of their business had pretty constantly and steadily amounted to a little under 5 per cent. This was in spite of the electric light or anything else. Over a series of years, their normal rate of increase appeared to be about 4¾ per cent.; and hitherto they had laid out their plans for meeting this increase. He need not inform the proprietors that the unprecedented increase in the past half year had very severely tried them—in fact, he did not suppose that any of their Engineers had ever gone through such a winter before. They had to look back—he himself certainly could not do so—for 45 or 50 years to remember anything at all to equal the severity of the past winter. It had affected them most severely; and though they had had a very large increase in their revenue from the sale of gas, the cost of producing it had also very seriously increased. But he found, from what he had heard upon all sides, from other gas managers and engineers, that this experience had been universal. In the first place, they had had a great deal of deterioration in their coal, from its being stored out in the wet and frost; and another cause of loss was that they had had inferior coals, owing to the great pressure at the pits. This had caused a difficulty in keeping up the supplies to the Company; and the contractors had not always sent them as good coal as they had expected to receive. Another cause of the bad result, as regarded expenditure, was the extraordinarily low temperature and high barometer, which had reduced the volume of gas sent out, as shown by the station meter. Lastly, there was no doubt—and he was sorry to say it—the working of the men had not been so good in the past winter. It might be that the influenza epidemic, which had affected almost everyone, had reduced the power of the men; but, whatever the cause, there was no doubt that they had not got so much work out of their men in the past six months as they had been accustomed to have previously. He might say that at Beckton they had not only had frost, snow, and canals blocked up, ice on the river, and influenza among their men—and he believed, too, in their coal, because its vitality had been so much reduced that they could not get anything like the same quantity of gas out of it—but their Chief Engineer there was also struck down by illness, and for some time his life was despaired of. Under these circumstances, they must not be surprised that the working had not been up to the mark; but he had no doubt that this was a state of things that would not recur. They had looked closely into it; and where any weak spot was detected, they would be prepared to counteract it in the future. To give an idea of what the augmentation in the consumption in the past half year meant, he might state that the increase alone of 9·55 per cent. was equal to the entire annual consumption at Bolton, Oldham, Salford, or Brighton. They had added in the course of the half year a business larger than any one of the gas businesses carried on in any of these towns; and their increase for the past twelve months—1,328,257,000 cubic feet of gas—would have supplied for a whole year either Nottingham or Bristol. Their Engineers and Managers, therefore, had had a great deal to cope with; and he was not at all surprised that the considerable increase mentioned in the consumption, coming on the top of the very bad weather, had tried them to the utmost. He was therefore only glad to be able to congratulate the Company upon making a gross profit of £50,000 in excess of that of the corresponding period of 1890, in spite of these adverse circumstances. With respect to the cost of working, the principal item was coal, of course; and the cost of coal had been 1s. 9d. per ton more than in the June half of the year 1890. Against this was the higher price obtained for residuals, which left the net increase in the cost of their coal at 1s. 3½d. per ton. Upon the whole quantity of coal which they had carbonized during the half year—1,100,551 tons—this amounted to a sum of £71,444, which was a very serious increase in the item of coal. Then the reduced make, which was 419 cubic feet per ton, had been chiefly, as he had already stated, at Beckton; and it might be analyzed in this way: The extra amount of coal they had used had cost them £9000; the extra coke for fuel for carbonizing the coal had cost £16,000; wages had been £2500 higher (this was for moving the coal); and the extra carbonizing wages, for making the gas, had been £4500—making altogether £32,000. At all their stations the make of gas per ton of coal carbonized had been lower; but he repeated that this feature had been more marked at Beckton than at any of their other stations. There was another matter he might mention—namely, the increase which had taken place in the cost of working during the extreme pressure. In fact, well on into this year they were obliged to work on Sundays; and for Sunday labour they had to pay double price. On the gas thus made there was therefore very little profit. The abnormal continuance of the frost interfered very much with the distribution of the gas. Their pipes became filled with naphthalene; and they lost a good deal through people not being able to get the gas they would otherwise have used. Numerous complaints were received; and they were remedied as soon as possible. This, however, had had a very adverse influence upon the sale of gas; but perhaps this was not entirely an unmixed evil, because he feared that if they had had to supply much more gas, some of their holders would have been down to the ground. The increased cost of coal consisted partly in what they had had to pay for it—that was, they had paid 1s. 0¾d. per ton more, which was equal to £60,000; they had lost by the result of the working 419 feet of gas per ton, which was equal to £38,000; they had used a larger quantity of coal (for the increased sale of gas) to the extent of £66,000; there had been an additional charge for cannel, for keeping up the illuminating power of the gas, of 4d. per ton, which was equal to £17,000; and the increased charge for lighterage and wages had been 5d. per ton, or £20,000. This made a total of £201,000, which their coal had cost them more than in the corresponding period of last year. He believed that some questions had been asked as to how they arrived at this cost. Common coal had cost 1s. 1d. per ton more; lighterage and wages, 4¼d. more; and cannel coal, 4¼d. more—making 1s. 9½d. He had troubled them with these figures because it was as well to know that it was not always the mere difference in the contract price which affected the cost of their coal; there were other things. He was reminded by the Deputy-Governor that they commenced every half year with a considerable stock of raw material on hand; and the price at which this stood in their books affected the average price at which they worked during the half year. There was a very interesting question, which he was quite sure must have passed through the minds of most of the proprietors, and that was with respect to the large amount they were taking from the reserve fund, in order to make up their dividend of 13 per cent. At first sight, this might appear very alarming; but in order that they might see the automatic working of the sliding scale, he had taken out the figures with respect to the reserve fund from January, 1889. At that date their reserve fund and undivided balance (which was really the same thing—the two sums being money earned but not divided) amounted together to £807,400. Up to the date of the present accounts —June 30, 1891—they had added to that amount, for interest, £34,913; so that they had to account to the Company and to the public for the sum of £842,313 since the 1st of January, 1889. After the payment of the dividend which they recommended that day, there would remain a balance of only £232,069. The total withdrawal from the fund in the two years and a half, therefore, had been £610,000. Of this amount there had been applied towards the reduction in the price of gas to private consumers north of the Thames, 2·89d. per 1000 cubic feet, or £512,000; and they had given to the proprietors £98,244 for the corresponding increase of dividend. Therefore, as he had repeatedly said, the working of the sliding scale was beneficia both to the consumer and the proprietor. But the proprietor got one-sixth and the consumer five-sixths of all the benefit arising from this fund. He had always said that he did not like to prophesy; but they invariably looked ahead, and made certain estimates. He told them last January, he believed, that they would have to dip into the reserve fund to the extent of £100,000 in the then current half year; but they had had to go £50,000 beyond that amount, through the causes which he had already mentioned. He believed that they might have to dip again (but to a much smaller extent) into this fund in the present half year; and also, perhaps, in the following half year, though to a still smaller extent. The new coal contracts would help them very much indeed; but they started with a stock of coal at high prices. Until they saw how the working of the Company went on, he could not predict what would be the exact amount they would have to take out of the reserve fund. But supposing they began to draw such an amount out of it as to make the proprietors alarmed with respect to their dividend, they would immediately reverse the process they had adopted during the last few years, and put the 3d. per 1000 feet back on to the price of gas. They would then pay 12¼ per cent. on their ordinary stock, instead of 13 per cent.; and they would get in a revenue of about £260,000 more—assuming that the sale of gas did not fall off. The thing was thus perfectly automatic. If the cost of gas production went up, and they were therefore compelled to increase their price, they would suffer to the extent of ¼ per cent. in their dividend for every 1d. per 1000 cubic feet that they increased the price. If coal was cheap and the working of the Company satisfactory, then, as they had done in the past few years, they would get their full dividend of 13 per cent., and

carry forward the balance to the reserve fund and undivided profits. He hoped the proprietors did not misunderstand him. He did not hold out any intention on the part of the Board to increase the price of gas; but he merely told them not to be alarmed at the reduction of the reserve fund, because, if it became extremely depleted, they would raise the price of their gas, as he had said, and this would decrease their dividend to the extent of ¾ per cent. Distribution had been carried on during the past half year very satisfactorily. There had been an increase in about the same ratio as usual in their business as regarded stoves, lamps, small dwellings, and gas-engines; and their leakage was satisfactory. Their business had continued increasing—the mileage of their mains and the area of their district—in fact, the whole business of the Company continued to progress; and he felt very little hesitation in saying that his opinion was that they had now turned the corner of the bad working and dear coal, and that they had very fair prospects in front of them. They had cheap coal in view; their improved plant in hand—their plant for cheapening the handling of the coal; they had the aid they hoped to obtain from water gas and from oil; and the saving they would experience in the cost of cannel. Not only this, but cannel was becoming almost exhausted. He saw there had been a discovery of cannel in Wales; and this might help them. But the rich Scotch cannel which they had been getting was now practically beyond their control. With the increase in daylight consumption, and the hope (though he spoke with bated breath about this) of some reduction in the very heavy rates they had to pay, he thought they had a list of benefits looming in the future; and they might regard the temporary drawback caused by the bad weather and other matters he had referred to without feeling too much depression. He had to express the great regret of the Directors at the loss which the Company had sustained by the death of Mr. Stephenson Clarke. That gentleman had always been of great assistance to the Company, not only as a Director after he had joined the Board, but before. Many a time, when they had been in an emergency, Mr. Clarke had helped them; and his death was a very severe loss to the Company. They had filled up the vacancy so occasioned by the election of Mr. John Birch Paddon, whose position in the gas world was so thoroughly well known that he was quite sure the proprietors would consider they had been exceedingly fortunate in securing his services. He might say that, even for the short time Mr. Paddon had sat at their Board, they had derived—he personally and his colleagues—the very greatest assistance from the varied information he possessed on every subject connected with gas making and gas accounts.

The Deputy-Governor (Mr. Howard C. Ward) briefly expressed his pleasure at seconding the motion.

Mr. Sadler, referring to the Governor's remark as to the receipt by the Company of inferior coal, inquired whether there was any check on the contractors against their supplying the Company with such coal. Could the Company return it, or get an allowance for it? With the very large increase in the price which they had to pay for coal, he thought they ought to receive a good article.

The Governor replied that the question was a very pertinent one; but he might reassure the proprietor by stating that they had every check on the quality of the coal supplied to them. In the first place, the coal was tested before they bought it; secondly, they could refuse it if it was not up to the mark (but unfortunately they could not refuse anything last winter); and, thirdly, they could, if they felt justified, demand a reduction in the price. They would see, however, that they had not everything under their own control in regard to their coal supplies. There had been the labour troubles in the North, and they had had to consider the position in which the coal-owners were placed; and it would not be just or wise to endeavour to get the last "pound of flesh" out of the coal-owners in their difficulties.

Mr. Coppen expressed satisfaction at the prospect of cheaper coal. With regard to inferior coal, he thought they must ask that their contracts might be carried out. He regarded the dividend of 13 per cent. as a very satisfactory result; but it had been obtained by a large encroachment on the reserve fund. The amount of the proposed dividend which came out of their earnings appeared to him to be about 8 per cent.; and it seemed that they had taken the other 5 per cent. out of the reserve fund.

Mr. Ross asked, as a good deal of stress had appeared to be laid by the Governor on the fact that their Chief Engineer at Beckton had been ill, if there was an "under-study."

The Governor, in reply, stated that they had not only one "under-study," but five "under-studies," at Beckton; and they were proposing to add a sixth, for their business grew so fast that the large increase to which he had referred overtook them so suddenly that even these six gentlemen were not sufficient to deal with it. Their chief man at Beckton being ill, and the others having all their detailed duties—construction, oil gas, water gas, &c.—they lost for a time their superintending eye over the general labour; and this was a serious thing. He ought to have said previously that in all coal contracts there were what were called strike, quality, and arbitration clauses; and therefore, unless they had a very strong case indeed, it would be very bad policy on their part to demand the "pound of flesh." They looked very carefully to see that they were not "done" in their coal; but where there was any little loss which could not be foreseen, and could not be provided against, it was only fair that the Company should bear a proportion of it. The proprietors might rest assured there was no "getting over" the Company by any of the coal-owners; and that the Company always had all that was bargained for. With regard to the reserve fund, they could not properly raise the price of gas as long as they had a decent amount at the credit of that fund. If, however, the fund fell below what the Directors considered a proper margin, they were bound to protect the dividend and increase the price of gas. They watched this matter very narrowly. They did not like to add to their revenue by increasing the price of their gas, so long as they had "shot in the locker." As it had always been the Directors' policy to tell the proprietors everything, he did not know why he should not tell them point-blank that they expected that they might have to reduce the reserve fund within the next year by something like £100,000—say, £60,000 this half year, and £40,000 next half year. This would bring the reserve-fund down £130,000. They then anticipated that they would begin to build it up again; but if not, they must raise the price of gas. They had really taken less from the reserve fund by £32,000 this half year than in the corresponding period of the previous year. It was true that it did not appear to be so, because the Directors spoke only of the reserve fund; but they had taken less from the reserve and undivided balance—which were both available for dividend purposes—by £32,000 than they did in the first half of the previous year.

The motion was then carried unanimously; and the various dividends were subsequently approved.

On the motion of Mr. Coppen, a vote of thanks was passed to the Governor and the Directors.

The Governor, in acknowledging the vote, said he hoped they would permit him to amend the resolution by including in it the Officers and Engineers of the Company. The duties of the Directors were not light; but they were nothing compared with those of the men at the different stations in such weather as that of last winter.

The proceedings then terminated.

SOUTH METROPOLITAN GAS COMPANY.

The Directors' Half-Yearly Report.

The following is the report of the Directors of the above Company, which, with the accounts for the six months ending June 30 last (to be given next week), will be presented to the proprietors at the half-yearly general meeting on the 19th inst.:—

In common with gas companies generally, there is again a considerable deficiency in the profit on the working of the half year, due mainly to the very high price of coal, but to some extent to a reduction in the value of coke, to the increase made in wages in 1889, and to a considerable increase in the cost of making gas, necessitated by alterations gradually adopted in the apparatus and methods of testing, which require the addition of about one candle to the illuminating power beyond what was necessary with the measuring instruments that were in use, and on which the bargain was made with the Gas Companies when the testing Acts were passed. As this extra candle cannot be obtained from the best ordinary coal available for London, the cost of producing it is very much greater than its value to the consumers, to whom the higher quality is generally inappreciable. At the best the benefit is very slight, and to those who use gas for heating, cooking, and manufacturing purposes, there is no advantage whatever. The cost to the consumers (for it is their question, as they and not the Gas Companies must bear it) of adding one candle to the illuminating power of the gas supplied by the three London Companies will not be less than 1½d. per 1000 cubic feet, or £165,000 a year.

To meet the deficiency of revenue, recourse must again be had to the reserve fund, from which £59,640 will have to be taken to pay the same dividend as was last paid. This will reduce the reserve fund to very nearly £60,000, below which it would be hardly prudent to go. Consequently, the Directors will be under the necessity of increasing the price of gas 3d. per 1000 cubic feet from Michaelmas next; for, although coal is slightly lower in price, it is still 50 per cent. dearer f.o.b. than it was two years and a half ago, and the other causes of deficiency above mentioned are still in full force. The Directors raise the price with great reluctance; but after reducing the dividend and absorbing three-fourths of the reserve fund, they feel they may fairly call upon the consumers to bear a small share of the heavy additions to the cost of gas caused by the great increase in the price of coal and labour.

Notwithstanding these adverse circumstances, there are substantial causes for satisfaction with the position and prospects of the Company. In the first place there has been an unprecedented increase in the use of gas, due to a considerable extent to the severe winter. It has not, however, been confined to the period of frost, but has continued all through the half year. The great demand for cooking-stoves on hire continues; and gas, while fully holding its own as the most convenient and cheapest lighting agent, is becoming more and more popular for heating and manufacturing purposes.

Another cause for satisfaction is to be found in the staff of officers and foremen, who are most loyal to the Company, interested in its prosperity, and who work together with the greatest goodwill. Similar commendation must be given to the workmen, who do their work in a cheerful and hearty spirit, and whose relations with their employers are of the most friendly character.

Within the last twelve months the consumers have invested, generally in small amounts, £107,484 in the Company, by taking the greater part of the last two issues of "C" stock.

The Directors recommend the payment of a dividend of 13 per cent., to be apportioned in the usual way, in accordance with the Scheme of Amalgamation, except a fraction due to the "A" stock undivided as usual. This dividend of 13 per cent. is in reality only about 5 per cent. to the investor, as all the capital issued since 1876 has been under the auction clauses.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. Howard C. Ward in the chair.

The Secretary (Mr. W. Croxford) having read the notice convening the meeting, the report of the Directors, and the statement of accounts for the six months ending June 30 last, which were summarized in the Journal last week, were presented.

The Chairman, in moving the adoption of the report, remarked that the accounts were not so rosy as those which the Directors had been in the habit of presenting. The severe weather experienced in the months of January, February, and March had adversely affected the results of the working of, he believed, almost every Metropolitan and Suburban Gas Company. In the course of a very long experience as a Director of Gas Companies, he had often observed that severe winter seasons, such as they had passed through, while they undoubtedly augmented in a very marked manner the volume of business transacted by those companies, increased the expenditure in a much

greater ratio; so that the additional business scarcely produced any profit for the Company, and very often resulted in anything but a profit. The shareholders might at first wonder why this was the case; but, if they looked at the revenue account, they would see that the Company had expended for coal during the half year an extra amount of £12,000, or thereabouts. Now they were working under the same contracts that they had for the year ending June, 1890; but although they had been working under those contracts, the cost of coal to the Company during the past half year had been a trifle above 1s. more than it was during that half year. The fact was that the Brentford Company, and any Company whose works were situated far up the river, and who were carrying on large transactions, were more punished by the river being stopped, and the difficulty of obtaining their coals alongside the works than people lower down the river were. They contracted to get their coals delivered in barges by water carriage alongside their works; and if that transit became impossible and the water was stopped, as it had been for a very considerable period, it then became necessary, although they had coals in the Thames, to take them round by rail (and this was what they had done), drop them at the sidings at Kew Bridge Station, put them into carts, and bring them to the gas-works. Besides this, labour troubles caused a great difficulty in getting coal at all; and, in order to make themselves perfectly safe, Mr. Morris very properly—and with the sanction of the Directors—bought coals wherever he could. It was the primary duty of a gas company to carry on its business, and on no account to let its consumers be wanting in the article of gas, especially during such a period as last winter, when they relied upon it for light as well as for heat. Well, that resulted in an additional price on the coal used by the Company of 1s. a ton—or rather more; amounting, he thought, on the whole 56,000 tons to £2800. But their difficulties did not stop here; because, although they contracted for coal of the same quality that they had had during the corresponding half year, owing to labour troubles and other difficulties, their contractors, though most anxious to send the coal they had contracted for, in many cases were absolutely unable to get it; and the Company were only too thankful to secure such coal as they could, and to get it round to their works. In addition to that, the coal they bought, and which they were glad to get—for all would remember what a severe time it was—resulted in a loss of make during the half year of about 500 cubic feet per ton of coal. Now that resulted in a loss, upon 56,000 tons, of £2800. These two items together made £5600. The difference between that and the £6971 was due to increased business. The increased business during the half year amounted to, he thought, about 10½ per cent.; but the cost of coals, owing to the difficulty of getting them, and the inferior quality of the coals, was increased by between 16 and 17 per cent. The next items he would call attention to were purification and wear and tear at the works. The cost of purification was nearly double. That arose in this way: They were obliged to purify by lime; and as the ground was covered with snow, the people could not get the chalk to make the lime, and the Company were obliged to get it where they could. Instead of having the lime brought alongside by barge, they were obliged to cart it; and when they did get the lime, it was unfortunately not of the quality that they had been in the habit of having when it was fresh burnt and delivered direct from the Medway. The item of purification had thus increased between 80 and 90 per cent. for the half year. The other item was one upon which he might congratulate the shareholders, although it was a very heavy charge against the Company; for it was an increase on the wear and tear of the works equal to cent. per cent. upon last year. It might seem strange to say he congratulated them upon this; but during the half year, they had pulled down a large number of the old horizontal retorts with which they used to work (and which, of course, were originally charged to capital), and they had put up in their place retorts which they believed would be more effective, more easily worked, and of great advantage in many ways—some of which he would not allude to. He might say that they would not require nearly so much labour, and they would get about 50 per cent. more generating power in the same house than they used to have under the old system. The old plant, of course, was charged to capital; and it was only fair when they had to destroy it, and put something in its place, that they should pay for the new thing out of the revenue, or else they would get two charges to capital instead of one. That, then, was the explanation of the charge for wear and tear being for the half year £14,000, instead of (as it was in the June half year of 1890) £7000. He would ask them to bear that figure in mind, because it so happened that they had made the whole dividend on the half-year's working except £7000; and therefore they would see that the £7000 which they were short of dividend for the half-year's work, they had expended in revenue and in improving the plant, as they were assured by Mr. Morris (in whom they had every confidence) was the case. Of course, the rental had increased very considerably. The business of the Company had increased 10½ per cent. Very wisely they raised the price 2d. per 1000 cubic feet when they saw the troublous times coming on. The result of the half-year's working was this—that they had made a profit of £24,104. They required for dividends £31,462 10s., which left a deficit of £7358 7s. 1d. Happily, by good work and providence in former half years, they had had a sum of undivided profits, besides the profits of the half year, of £43,448 18s. 6d., from which, if they took the deficit of £7358 7s. 1d., they might declare a dividend at the usual rate of 12½ per cent., and carry over the substantial sum of £36,091 11s. 5d.

The resolution was seconded by Mr. J. Orwell Phillips, and carried unanimously.

In reply to Mr. Montague, the Chairman said it was very difficult to state the difference in the cost of lighting by electricity and by gas.

Mr. Neville added that he had been informed that in Norwich the cost was then three times that of gas, although the price charged there for the gas was much higher than that charged by the Brentford Gas Company.

A dividend of 5 per cent. was then declared on the preference stock; 12½ per cent. on the consolidated stock; and 9½ per cent. on the new stock.

A vote of thanks to the Chairman and Directors, the Auditors, the Engineer, the Secretary, and the other officers of the Company concluded the proceedings.

GLASGOW CORPORATION GAS SUPPLY.

Report and Financial Statement for 1890-91.

The Glasgow Corporation Gas Committee have just completed, for presentation to the Town Council, their twenty-second annual report and balance-sheet, which embraces the year from June 1, 1890, to May 31, 1891. They state that—

The gross revenue amounts to			£483,576 13 1
The gross expenditure to	£423,794 12 2		
To which is added depreciation written off capital	11,564 2 7		
		435,358 14 9	
The balance carried to the profit and loss account being			£48,217 18 4
Out of this the following sums have been met:—			
Annuities on Stock	£33,893 8 10		
Interest on borrowed money	11,173 18 2		
	£45,067 7 0		
Sinking fund	2,000 0 0		
		47,067 7 0	
Leaving a surplus on the year's operations of			£1,150 11 4
The balance brought from last year's account was			£3,245 17 3
To which add the above surplus			1,150 11 4
Making a total of			£4,396 8 7
Out of this have been paid—			
To the Corporation—proportion of expenses in Boundary Commission of Inquiry and promoting Boundaries Bills, 1888, 1889, and 1890	£3,104 9 4		
Preliminary expenses, electric light	282 6 10		
Do. in connection with purchase of the Partick, Hillhead, and Maryhill Gas Company's undertaking	315 0 0		
		3,701 16 2	
Leaving a balance to be carried forward to the credit of next year's account of			£694 12 5

Dealing with the question of coals to be supplied during the current year, the Committee state that they advertised, as usual, and have contracted for the greater proportion of the quantity required, at an increase over last year's prices. Notwithstanding this increase, and the fact that a larger sum will be needed for interest on capital expenditure (owing to the purchase of the works of the Partick, Hillhead, and Maryhill Gas Company, and of those of the Pollokshaws Gas Company, and to the ordinary extension of the works and plant), also that the profits of the year just closed show a decrease as compared with those of the previous year, admitting of only 1 per cent. for depreciation on works and pipes, the Committee, in the hope that the extra expenditure occasioned by the railway strike and other causes will not recur, recommend that the price of gas be continued for another year at the present price—viz., 2s. 6d. per 1000 cubic feet. The quantity of gas sold or accounted for during the year is 3,125,981,000 feet; being an increase of 13·54 per cent. over that of the preceding year. The sinking fund, with its accumulations, now stands at £237,981 12s. 8d.

By the Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Act, 1891, which received the Royal Assent on the 3rd of July last, the works and pipes, &c., of the Partick, Hillhead, and Maryhill Gas Company are now vested in the Corporation, and will appear in the capital account of next year's statements, together with the works and pipes, &c., of the Pollokshaws Gaslight Company, which are also now the property of the Corporation. The acquisition of these works will remove all possible opposition to the continued progress of the Corporation Gas Trust and to the extension of the city.

Speaking of the works, supply, &c., the Committee remark that the great increase in the consumption of gas during the past winter (largely caused by its use for other than illuminating purposes, as well as by the increase in the number of consumers) taxed the producing power of the works to the full extent, and has rendered considerable extension at the various stations necessary. At the Dalmarnock works, additional purifiers and a new station meter are being erected; at the Dawsholm works, condensers, scrubbers, exhausters, and purifiers are in course of construction; and at the Tradeston works the construction of another retort-house is in progress, and purifiers have been contracted for. It is hoped that these extensions will enable the Committee to meet the demands of next winter; but further extensions will require to be commenced without delay.

The question of the gas storeage capacity of the works has been for some time under consideration by a Special Sub-Committee. The necessity for further accommodation in this direction will be apparent when it is stated that the total capacity of the present gasholders at all the stations is only 11,770,000 cubic feet, while the maximum quantity of gas now being sent out from the works has reached 21,759,000 cubic feet in 24 hours. This deficiency in storeage adds considerably to the expense of manufacture; and it was the cause of some inconvenience to consumers in foggy weather during last winter. The Sub-Committee having now reported on the matter, it has been resolved to commence without delay the construction of a large gasholder, to contain upwards of 5 million cubic feet, upon a portion of the ground recently acquired from the Partick, Hillhead, and Maryhill Gas Company. When this is completed, it will add greatly to the efficiency of the supply; but as it is highly desirable that the storeage should be equal to at least 24 hours' supply, the construction of additional holders will have to be carried out with as little delay as possible.

The works generally have been maintained in an efficient state of repair during the past year. The repair of the two gasholders at the Dawsholm works which were injured in January last is now approaching completion; and they will be in use before the beginning of next winter's season. The works recently acquired from the Partick, Hillhead, and Maryhill Gas Company and the Pollokshaws Gas Company will continue to be carried on, with as little alteration as possible, during

the approaching winter. In the spring of next year, by connecting the main pipes, it is hoped that one or other of these works may be closed, and the manufacture concentrated as much as possible.

The greatest quantity of gas sent out in 24 hours was 21,759,000 cubic feet; being 5,193,000 cubic feet more than the largest output in any one day during the previous year. The loss by unaccounted-for gas was 10·90 per cent., as compared with 9·98 per cent. in 1889-90. The number of meters in use on the 31st of May was 139,013; being an increase of 4798 over the number in use on the same date last year. There were 16,887 meters repaired during the year; 4337 were examined while in use, of which 3715 were found to be in a satisfactory condition, while 622 were defective, and were removed. New mains to the extent of 27,610 yards were laid during 1890-91; being 10,386 yards more than in the previous year. The number of gas-stoves lent out on hire on May 31 was 7963; being 1348 more than at the corresponding date in 1890. The number of gas heating and cooking appliances sold during the year was 2276.

The accounts of the Glasgow Gas Trust for the year 1890-91 include a number of interesting data, which may here be briefly summarized. In the statement of stock capital no change appears. There is a total of £300,000 in the shape of perpetual annuities, on which 9 per cent. per annum is paid; and along with it there is a sum of £115,000 in the form of 6¾ per cent. annuities. On these two amounts the annuities or dividends paid come to £34,162 10s. Under the several Acts of the Trust, powers have been taken to raise, in the shape of loan capital, £1,000,000. A year ago the total amount that had been borrowed was £244,632 15s. 11d. The major portion of this consisted of mortgages bearing interest at the rate of 4 per cent. per annum; all the rest being obtained from the Glasgow Corporation loans funds at 3½ per cent. interest. During the year there was borrowed from the same source a further sum of £65,000, bearing interest at a like rate; so that the sum now left to be borrowed under parliamentary powers stands at £690,367, against £755,367 a year ago.

At the close of the past financial year, the works, pipes, plant, and all other property belonging to the Gas Trust, with the depreciations taken off, stood at £700,475, as compared with £637,132 on May 31, 1890. As already indicated, the amount written off the value of the works, pipes, &c., in the shape of depreciation, was only 1 per cent., whereas in the year immediately preceding it was as much as 7½ per cent. The amount written off for depreciation of the value of the meters was 6 per cent. as usual. In the course of the year 1890-91, additions were made at the Dalmarnock works, at a cost of £13,042; and the cost of the year's additions to the Dawsholm and Tradeston works was, respectively, £17,235 and £15,284. So that at the close of the year the three works were rated respectively at £101,872, £145,258, and £109,962. In the shape of extensions on the pipes during the year, there was an expenditure of £10,479; the total valuation at the close of the year being £173,843. Meters were added of the amount of £15,751; and the year 1891-2 began with the meters having a valuation of £117,609. On the other side of the capital account, the annuity stock, loan on mortgage, and Corporation loans fund borrowings stand at £528,100, as compared with £463,100 a year ago. Then there are the mortgage redemptions out of the sinking fund, and a Corporation loan redeemed—together, £196,532; so that there is now a total of £724,632—leaving a balance of £24,157.

Coming to the revenue account, we find that the quantity of coal purchased was 379,130 tons, at a total cost of £224,677 1s. 9d., against 319,417 tons 7 cwt., at a total cost of £158,407 14s. 7d., in the year 1889-90. On all the other items under "Manufacture of gas" there was a very material increase, except that of salaries of Engineers, Superintendents, and Officers at works, which was almost exactly the same as in 1889-90. The total expenditure under that general head was £359,819 18s. 3d., as compared with £255,602 5s. 10d.; so that the increase for the year amounted to £104,217 12s. 5d. No very material increase is found under any of the other general heads; and the year's outlay stands at £423,794 12s. 2d., against £317,825 17s. 8d. for the year 1889-90. The amounts written off for depreciation during the year are given at £5062 on works and pipes, and £6502 on meters—total, £11,564, as compared with £52,570 for the preceding year. The sum written off for the year's depreciation, added to the actual expenditure, gives a total of £435,358. The revenue from sales of gas amounted in the course of the year to £385,102, against £339,505 in the preceding year. For coke sold there was obtained £36,767, against £27,200 in 1889-90; and for ammoniacal liquor and tar, £60,257, against £49,425. The waste lime revenue shows a falling off; but the rents of house properties and chemical works exhibit an increase. The total revenue, as formerly mentioned, is put down at £483,576, as compared with £417,589 in the preceding year. The balance of £48,217 on the year's working is thus brought out, and is carried to profit and loss account. When the financial statement was made up for the year 1889-90, the balance worked out to £47,043.

In the statement of the profit and loss account (net revenue) and the general balance-sheet, there is nothing calling for any special remark, except in the case of stocks on hand (gas coals, lime, coke, and horses at stations), which are this year set down at £30,632, against £11,513 a year ago—all the individual items showing an increase.

The sinking fund stood at £227,123, and the sum of £2000 carried from the revenue of the past year was added to it; thus making £229,123. During the year there were accumulations in the shape of interest on redeemed debt, and miscellaneous increments, in all amounting to £8858; so that at the beginning of the present financial year (June 1) the amount of the sinking fund stood at £237,981. This is invested to the extent of £196,532 in the shape of redeemed mortgages, and in the shape of sums paid into the Corporation loans fund to the extent of £39,449.

The Dangers of Electric Light Wires.—Shortly after ten o'clock last Thursday night, the Birmingham Fire Brigade were summoned to a fire at Moor Green Hall, the residence of Mr. Arthur Chamberlain. On their arrival, they found that the flooring of one of the bedrooms had been on fire; but that it had been extinguished by the family with the assistance of the members of other brigades. It was supposed that the outbreak had been occasioned by an electric light wire.

SALFORD CORPORATION GAS SUPPLY.

The Hunter Frauds Again—The Right of Action against Contractors—The Alleged Attempt to Bribe the Gas Engineer.

Our readers may remember that, early in the present year (see JOURNAL for Jan. 13), the Salford Town Council appointed a Special Committee to obtain Counsel's opinion as to whether the Corporation had any right of action, and if so against whom, in regard to the late frauds in connection with the Gas Department. The following was the resolution of the Council in accordance with which the Committee was appointed: "That, in view of the judgment of the Court of Appeal in the case of the *Corporation v. Lever*, as to the rights of the Corporation against contractors, the Town Clerk be and is hereby instructed, under the direction of a Special Committee (to be now appointed), to prepare a case for the opinion of Mr. Rigby, Q.C., as to whether the Corporation has any right of action in connection with the gas frauds, and against whom respectively, and as to whether evidence in each case is of such a character as to render action advisable, having regard to the release given by the Corporation." The Committee consulted Mr. Rigby and Mr. Smyly, whose joint opinion was laid before the Council at their meeting last Wednesday. It was as follows:—

The Corporation of Salford had a right of action against every contractor who bribed Hunter, which action could have been maintained either against the contractor severally, or against the contractor or Hunter jointly, for such damages as the Corporation might have suffered from the joint fraud of the contractor and Hunter. But there is a well-settled rule, that if there are two joint tortfeasors, and the third person to whom the wrong has been done releases one of the two tortfeasors, such third person cannot afterwards sue the other tortfeasor. If, therefore, the deed of the 4th of June, 1890, releases Hunter from liability for the joint fraud of himself and the contractor, it acts as a release to the contractors. We are of opinion that it does release Hunter from all liability for such joint frauds. The very general words at the end of the deed must be considered as qualified by the recitals; nevertheless we think there is sufficient in the recitals to show that the release was intended to cover frauds committed jointly with the contractors, and that in so releasing Hunter the contractors also are released. The deed of the 4th of June, 1890, containing the release of Hunter, has entirely altered the remedies of the Corporation against contractors, and has rendered much of the judgments in *The Mayor, &c., of Salford v. Lever* (1891, 1 Q.B. 168) inapplicable. We think that the Corporation have now no right of action against any contractor who contributed to the sum of £10,000 mentioned in the release; and that under all circumstances, they would not be reasonably justified in instituting proceedings against any of them. We doubt whether the Corporation ever was in a position to prove that the substitution of Pleasley for Bestwood cannel was fraudulent; but, assuming that it could be proved, we think that the release also discharges Hunter from that fraud, and that consequently the right of action against Wrigley is gone. This transaction is one of those charged against Hunter as being fraudulent by the 8th paragraph of the statement of claim in the action against Hunter and Hawkins; and it seems to us that all the torts charged against Hunter in that action were intended to be covered by the release.

The MAYOR (Alderman B. Robinson) moved that the report of the Special Committee, embodying the preceding opinion, which had been given upon two statements of the case—one prepared by the Town Clerk and the other by Mr. Rycroft and Mr. Desquesnes—be received and adopted.

Alderman KEEVNEY, in seconding the motion, said that every point, every side issue, every controversial question that could be raised in relation to this matter had been put in writing before Counsel; and the whole of these points had been decided upon. He hoped, therefore, that the matter would now drop, and drop for ever.

Mr. SNAPE said that, so far as civil actions were concerned, it appeared pretty clear that the Corporation had no hope of success. But there was one point which to his mind had never yet been cleared up; and before this unhappy business was allowed to sink into oblivion, the Council were entitled to some explanation with regard to it. It was well known to them all that a certain contractor swore most solemnly in the Assize Courts of Manchester that he had never given Mr. Hunter a single farthing in the form of bribe or commission; and yet they knew that this man's name appeared in the agreement with Hunter, and it was well known also that he subscribed something towards the £10,000. It therefore appeared that he had committed perjury; and he (Mr. Snape) wished to know if this matter had been laid before Mr. Rigby, or merely the question of civil proceedings.

Mr. MANDLEY said Mr. Keevney would find that "every point and every side issue" had not been disposed of. He proceeded to express regret that the person to whom Mr. Snape had referred should be allowed to get off scott-free after they had put into gaol Hunter, who was probably his victim. He (Mr. Mandley) and those who thought with him could not get rid of the idea that there had been an official attempt in the Council to protect contractors, and more especially the one referred to; and he knew that the men whose names appeared in connection with the release would give thousands of pounds to prevent any further inquiry. Alderman Keevney desired the thing to pass into oblivion; but it would never pass into oblivion as long as Salford existed. It would form one of the chief items in the annals of the borough. It appeared to be Counsel's opinion that, in consequence of the way in which the release had been drawn, the Council had now no hope of succeeding in a civil action. He should like to know who was to blame for the craft with which the release had been drawn.

The MAYOR: You must withdraw that word. There has been no craft at all.

Mr. MANDLEY: Three or four Judges denounced it as an infamous document.

The TOWN CLERK: They did nothing of the kind.

The MAYOR: You must withdraw that word, Mr. Mandley. I shall decline to hear you further unless you withdraw.

Mr. MANDLEY (rising amidst cries of "Chair"): I say it is as I have said, and that the Judges——

The MAYOR: It is an insult to myself and the Town Clerk unless you withdraw.

Mr. MANDLEY said he must decline to do so, and would take the consequences.

The TOWN CLERK said there was one remark he should like to make, and that was with reference to what Mr. Mandley had said about an

"official attempt" to prevent investigation of the gas frauds. As the official who had had charge of the matter, he wished to give that allegation a positive denial. Every exertion he could command had been brought to bear to punish the perpetrators of these frauds; and he defied Mr. Mandley or any man living to show that he had done anything to stifle investigation. Replying to the question put earlier in the proceedings by Mr. Snape, with reference to the contractor who is understood to have been the chief sinner in respect of the giving of bribes to Hunter, he went on to say he had no absolute proof that the person in question did contribute anything towards the £10,000 which the Corporation received from Hunter; but he believed, with Mr. Snape, that he did contribute. He (the Town Clerk) did not think, however, that this alone would prove that he committed perjury, because there were many people who had actions brought against them who contributed something to settle the matter rather than be taken into Court.

Mr. SNAPE inquired whether there was a *primâ facie* case against the contractor on the facts as stated.

The TOWN CLERK said that there again was a difficulty, as there were only two men who had the evidence on which a conviction could take place—one being the contractor, and the other Hunter. Were they likely to get Hunter to give evidence on the point?

Mr. SNAPE said he thought they were at present going to proceed against a man with regard to whom they had much less evidence.

Mr. RYCROFT proceeded to discuss the various points in the opinion of Counsel. He said it was unfortunate that the Town Clerk's judgment, or discretion, should have led him to persist in having his view put forward in preference to the view of Mr. Desquesnes and himself, because the result had been that Counsel had had two cases put before them. Although it might be presumptuous in him to say so, Mr. Rigby did not appear to have addressed his mind to the real point in the case. He (Mr. Rycroft) still held that there was a separate cause of action, and that the contractors who were not parties to the deed could not claim that they had been released. With regard to the particular contractor previously referred to, the Town Clerk said he did not know whether or not he had contributed to the £10,000. At any rate, the contractor ought to be afforded an opportunity of pleading. If he had not contributed to the £10,000, he was not released; and they would be bound to take proceedings against him. To his mind, a very grave responsibility rested on the parties who brought forward the release, the sealing of which, in Counsel's opinion, precluded the Corporation from taking further action. The Corporation could have escaped from the terms of the discreditable compact with Hunter by refusing to seal the release; but instead of this, they supported that ignoble document. He moved, as an amendment, that the adoption of the report be adjourned for a month.

Mr. MANDLEY seconded the proposition.

Mr. DESQUESNES said that while he was disposed, like Mr. Rycroft, to bow to the opinion of Counsel, he regarded it as in some respects unsatisfactory. Instead of merely saying that they had no right of action, he thought Mr. Rigby might have gone into the process by which he arrived at his conclusions. In this and other ways the opinion might have been more satisfactory.

After further discussion, the matter was referred back to the Committee, in order that, if considered desirable, they might communicate again with Mr. Rigby.

In the meantime, it was understood that the Town Clerk would endeavour to ascertain the names of the contractors who contributed to the £10,000; and when this information had been obtained, the Council would consider the desirability of proceeding against those who did not contribute.

Subsequently the Gas Committee presented the minutes of their proceedings in connection with the recent alleged attempt to bribe the Gas Engineer, to which reference was made by our Lancashire correspondent last week (p. 224). Thereupon Mr. Mandley asked if the fiat of the Attorney-General had been received; and he was informed by the Town Clerk that it had. The minutes were confirmed without discussion; and it is understood that the result will be an instruction to the Town Clerk to institute proceedings against the person implicated in the matter, in accordance with the decision previously come to by the Committee.

Gas Committee's Annual Report.

The Gas Committee's report for the year ending the 25th of March last was also presented. They stated therein that there had been a large falling off in the profits, in consequence of the advance in wages, the high price of coal, and the diminished consumption of gas owing to the strikes; but they nevertheless hoped to avoid making any addition to the price of gas, and by careful management to recover, ere long, their position. These anticipations have been realized; and the Committee reported an increase in the output over the previous year of 15·47 per cent., a reduction in leakage of 2·81 per cent., and an increased average yield of gas per ton of coal of 857 cubic feet, together with a decrease in the amount of bad debts—the figures being £399 last year, as compared with £529 in 1889-90. Further increases were reported in the receipts for gas, and meter and stove rents, amounting to £19,176. There were also higher receipts for coke, £3610; tar, £1053; and ammoniacal liquor and sulphate of ammonia, £1890. After making the necessary contributions to the redemption and depreciation funds, and providing for interest and annuity charges, there remained for apportionment among the Salford, Pendleton, and Broughton districts a net sum of £16,832. In view of the improved results of the year's working, and in order to stimulate the demand, the Committee again reduced the price of gas 2d. per 1000 cubic feet to all consumers from the commencement of the current financial year. This is the third reduction in the price since March, 1888; amounting in all to 9d. per 1000 cubic feet in the borough, and 11d. per 1000 cubic feet in the out-districts. The sale and hire of gas cooking and heating stoves has improved considerably. During the past year 111 cooking-ranges were supplied on the hire system, 44 on the hire-purchase system, 38 were sold, and 76 heating-stoves were sold. The Committee expressed the belief that when the advantages of the use of gas for cooking and heating become more widely known, a much larger business will be done in this department; and they have arranged for a series of lectures to demonstrate the uses of coal gas. Within the works during the past year there was perfect tranquillity; and the work of the undertaking has been well and efficiently performed. In connection with the workmen, it is mentioned that the Committee propose to establish an accident fund, the details of which are now under consideration, whereby in case of injury there may be some provision made for support and assistance in time of need. The unappropriated capital of the department being exhausted, the Committee applied to the Local Government Board for authority to borrow an additional sum of £134,000, and for power to purchase a piece of land, belonging to the Lancashire and Yorkshire Railway Company, contiguous to the Liverpool Street works. As soon as the necessary power has been obtained, it will be necessary to proceed with the erection of an additional retort-house and retorts on this land, in order to meet the increasing demand for gas. The alteration and rebuilding of the retort-house at the Liverpool Street works and the hydraulic engines, accumulator, and waggon hoists in connection therewith, are being proceeded with, and will be completed ready for work next winter. The sulphate plant continues to act very satisfactorily, and the year's working has fully justified the expectations of the Committee.

The report was adopted.

THE BRIN OXYGEN PROCESS OF PURIFICATION AT SHREWSBURY.

Our readers are aware that the Brin oxygen process, as applied to purification with lime, has been in use for some time at the works of the Shrewsbury Gas Company, under the supervision of Mr. W. Belton, Assoc. M. Inst. C.E., the Engineer and Secretary. Shortly after it was adopted, it was found that the plant was not large enough for the requirements of the works; and therefore it had to be stopped to allow of its extension. As this occupied about two months, it seems to have given rise to an impression that the process had been abandoned. This is not the case; and, the alterations having been completed, it has been in operation again for nearly a month. So far from there being any intention of abandoning the system, the results obtained with it are highly encouraging, as will be seen from the following statement:—

Results of Purification Operations at the Shrewsbury Gas-Works.

	Without Oxygen. Year ending June 30, 1890.		With Oxygen. Year ending June 30, 1891.
Gas made	125,777,000 cub. ft.	..	133,468,100 cub. ft.
Purifiers in use	One set, 24 ft. by 20 ft.; five tiers = 2 ft. 4 in. depth of lime.	..	One set 24 ft. by 20 ft.; five tiers = 2 ft. 4 in. depth of lime.
	One set, 12 ft. by 20 ft.; four tiers = 1 ft. 2 in. depth of lime.		—
Lime used	337 tons 19 cwt. = 60¼ lbs. per ton of coal.	..	288 tons = 46½ lbs. per ton of coal.
Oxide used	None.	..	None.
Coal used	11,406 tons 14 cwt. 3 qrs. Ruabon W. and B. and Wynnstay.	..	13,034 tons 2 cwt. 2 qrs. Wynnstay only.*
Cannel used	1163 tons 12 cwt. Nottingham 22-candle.	..	832 tons 16 cwt. 3 qrs.† Nottingham 22-candle.
Illuminating power of gas	16·64 candles.	..	16·84 candles.
Total sulphur, average	10·61 grains.	..	11·50 grains.
Wages for purifying	£94 10s. 11d.	..	£79 3s. 1d.
Cost of extra labour	—	..	3s. per week for attending producer.
Fuel to producer	—	..	9 cwt. of coke per 24 hours.
Nuisance	Awful smell from sulphur boxes, and threatened with action.	..	Scarcely any smell; very little nuisance.

* The coal used in 1891 is very inferior to that previously employed.

† The winter of 1889-90 was mild; whereas that of 1890-91 was exceptionally severe.

Remarks.—The oxygen plant was not in full working order until July 27, 1890; and there was not sufficient oxygen from Nov. 16 to Jan. 30. The plant was put out of use for enlarging on May 30, 1891.

The Pretoria Water-Works.—The new Pretoria Water-Works were recently opened by the President of the Transvaal Republic. The scheme was designed by Messrs. Pritchard and Co., of Westminster and Birmingham, after a personal examination of the district by Mr. E. Pritchard, M.Inst.C.E. According to *Industries*, the water is obtained from a place known as "The Fountains"—a title given to an extraordinary spring of beautiful water, of which there is available some 5 to 6 million gallons per day, rising out of the rocks at an elevation of about 5000 to 6000 feet above sea-level, and nearly 200 feet above the level of the city. The supply is by gravitation; and the whole of the large water-mains are of thin rolled steel with lap-welded joints. There are some 50 miles of mains and pipes, from 18 inches in diameter downwards; the excessive cost of transport by bullock-waggon rendering absolutely necessary the substitution of wrought-steel tubes for cast-iron pipes. The works are designed for the ultimate supply of 40,000 people; and they have so far cost approximately £100,000. The annual expense of supply will be a minimum one, consequent upon the natural facilities offered in the construction of the works, and the great purity of the water discharged from the rocks at "The Fountains" both in winter and summer—unvarying in quality, always bright and sparkling. The Pretoria Water-Works Company, Limited, are entitled to a maximum price of 10s. per 1000 gallons; this being the sum charged a short time since in some of the South African cities. The lap-welded steel mains were manufactured by Messrs. James Russell and Sons, of Wednesbury, and the service-pipes by Mr. E. Smith, of Wednesbury.

AN INTERESTING CASE OF "REASONABLE SECURITY."

Sheriff Guthrie, one of the Glasgow Judges, was recently asked, by mutual arrangement between the Glasgow Corporation Gas Commissioners and one of their customers, through her legal adviser, to give a judicial opinion on a matter of considerable importance to both parties, but on which they could not themselves agree. The nature of the case is explained in the learned Sheriff's opinion with sufficient fulness; but it may be mentioned that the *pros* and *cons* of the case were submitted to him in a debate in his chambers by Mr. Bowers, Clerk to the Gas Commissioners, and by the consumer's agent, Mr. Jubb.

The "opinion" of Sheriff Guthrie is as follows: I am asked to determine what is "reasonable security" in the sense of the 64th section of the Glasgow Corporation Gas Act, 1869, for the gas to be supplied by the Corporation. By that section of the Act, the Corporation is bound, on the request, in writing, of the owner or occupier of any building or part of a building within 50 feet of which any main is laid, to furnish a supply of gas on certain conditions, one of which is as follows: "That the owner or occupier making such request do, if required by the Corporation, give to them, at his own expense, reasonable security for payment for the gas to be supplied." Mrs. Frame, who carried on a milk shop in North Street, has applied for gas for a second shop which she is starting in West Graham Street, and has been asked for security. The security proposed by the Corporation is in the usual form—namely, a deposit of a sum of £3, the probable value of the gas consumed up to the first ordinary period of collection. Mrs. Frame objects to deposit the money in the hands of the Corporation; but she offers to deposit it in bank in the joint names of herself and the Treasurer. The Corporation say that this form of deposit would prove troublesome in the event of the death or emigration of the consumer, or if for any reason she should refuse to sign the deposit receipt and insist on a deposit in their own hands; but they are willing to take in lieu of it a guarantee by a banker or by her law agent. The main reason for Mrs. Frame's objection to the deposit asked for is the loss of bank interest; and it appears that she was not offered at the Treasurer's office what Mr. Bowers now says the Corporation will allow—either bank interest or to accept, in lieu of money, a deposit receipt in the Gas Treasurer's name or indorsed to him. I am of opinion that, in the circumstances, Mrs. Frame's proposal is not an offer of reasonable security. Security has to be got from a very large number of consumers—many of them small consumers. I think it was said from 10 per cent. of the 160,000 consumers. It is evident that a great deal of trouble and difficulty would be occasioned if the Corporation were obliged, in every case of failure in payment, to rely upon a deposit receipt which could not be cashed without either the consent of the consumer or legal proceedings of one kind or another. There is some evidence of the reasonableness of the course adopted by the Corporation in the fact that it has been followed for 22 years without any question having been raised until this time. Apart from this, it seems quite fair and intelligible that the Corporation, which is compelled by the statute to supply gas to all applicants, should be protected by having the security money in its own hands. If, indeed, it were to insist in all cases on handling the consumers' money, that might sometimes be a practical refusal to fulfil its statutory obligation, and would be unreasonable. But it is not alleged that it has done so in this or any other instance. The Corporation is a public body, representative of the whole body of consumers; and it is not likely to deal harshly with its constituents and consumers. It therefore seems not unreasonable that, wherever it can, it should insist upon having security in the manner most workable and least burdensome to the community. The only element of hardship or injustice is removed when the Corporation say: "(1) We will take your deposit in such a form that you will not lose any interest; and (2) if you prefer it, we will accept a cautionary letter from your banker or your agent." I am not sure that the offer of interest was necessary to make the demand reasonable; for the Act says the security shall be at the applicant's own expense. But I need not say more, for this offer is now made; and parties are agreed—partly because it was not sooner made—that the expenses shall be borne by them equally.

THE BELFAST CORPORATION AND GAS AND ELECTRIC LIGHTING.

At the Meeting of the Belfast Corporation on the 1st inst.—the MAYOR (Mr. Alderman C. C. Connor) in the chair—the subject of electric lighting was brought forward, on the presentation of an interim report by a Sub-Committee who have been making inquiry into the matter with the view of providing an installation for a district of the city. They expressed the hope that they would be able to report fully thereon during the present month, when the necessary extension of the gas-works would at the same time be dealt with.

Mr. CLARKE having moved the adoption of the report, and the motion having been seconded,

Mr. YOUNG said he desired to draw the attention of the Council to the question of electric lighting. As a member of the Gas Committee, and having some knowledge of the present needs of the city of Belfast, he expressed the opinion that the report of the Committee should have been before the Council at an earlier date. The gas-works of Belfast must be very considerably enlarged; and, if this was to be done, he submitted that the work should be started at once. He had it on the best authority that, even if it was commenced this winter, it would be three years before proper accommodation would be made for a sufficient supply of gas for Belfast. He had made a thorough investigation of the works, and found that on the 19th of December last year the utmost output of gas that could be had was 6,250,000 cubic feet. This being the full extent to which they could supply, he found that on the 19th of December there was an output of 6,891,000 cubic feet. In other words, there was more gas sent from the gas-works in 24 hours than they had capacity for. He was pointing this out as a warning to the Council. Electric lighting would never do for domestic purposes in Belfast. Suppose anything happened to their works, they could not store sufficient gas therein to supply Belfast for a single day. The domestic use of gas was increasing 10 per cent. every year. They as a Corporation, even if they had electric lighting, would be bound to supply, under a heavy penalty, every household with gas from day to day. He hoped that, before the next meeting, the report would be ready; and, taking a great interest in the gas-works, that the Mayor would convene a meeting in the interim for the purpose of obtaining sufficient ground for the extension of the works.

The MAYOR said the Council appointed a Committee some time ago to visit London for the purpose of inspecting the installations of the electric light there—not for the purpose of deciding between gas and electric lighting, but with the view of deciding as to the best means of applying the latter to the district of Belfast to be lighted under the Provisional Order obtained for the purpose. Following this up, the Committee went to a number of electric lighting stations. There were some difficulties in the way of that Committee reporting fully at present. It was true that they found the electric light in practical operation in London; but, at the same time, they were not able to get proper data as to the cost in order to lay a full statement before the Council. Further inquiries were being made in order to complete the report. There was a tendency in the public mind to imagine that, because they were going to light a small district of Belfast by electricity, therefore all progress in the gas-works should be stopped. No greater mistake could be made. The experience of large cities such as Manchester, Leeds, and other places, was that, although they had the electric light fully employed, the consumption of gas was actually increasing every day. He thought it would be well for the citizens of Belfast to get it out of their minds that, for the present at least, the electric light was likely to be a successful rival of gas. On the contrary, as Mr. Young had put it, there existed an urgent necessity for the extension of their gas-works. They would have to take into consideration, at an early date, how they were going to do this. The principal question was as to where they were going to find the space for the works. The public would have to make up their minds very soon, because they ran a great risk in going through another winter without having an increased gas supply.

The report was adopted.

The Dispute with the Lisbon Gas Companies.—According to a telegram received through Reuter's Agency, the persons arrested owing to the disturbances in the streets of Lisbon on the 1st inst., in connection with the action of the Gas Companies in raising the price of gas from 25 to 45 reis per cubic metre (the maximum allowed in their contract with the Municipality) were transferred last Thursday from the war vessels and the Saint Julien Tower to the city prison; the Minister of War having informed the Minister of Justice that he did not wish to detain civilians in a military prison. There were between 500 and 600 arrests; and a corporal of police was shot through the neck.

Gas Apparatus Exhibition at Bournemouth.—In the Sanitary Section of the Museum of the British Medical Association at their recent Bournemouth meeting, there were some excellent gas exhibits. Messrs. Thomas Fletcher and Co. displayed their cellular cast-iron cooking ranges, boiling-burners, and gas-fires. Messrs. Unsworth and Richmond had a very attractive stand filled with their novelties in the way of grillers, hot-plates, water-heaters, &c. Messrs. Sinclair and Co. had a variety of carbon and other gas-burners in operation, including Kinnear's self-lighting gas-burners, suited for the medical profession. Mr. John Greenall, of Manchester, made a good show of steam washers; whilst the new "Globe" high-power regenerative lamps of the Thomas Lighting Company attracted considerable attention. The finest stand undoubtedly was that of Messrs. Charles Wilson and Sons, of Leeds, who had their latest gas-fires well displayed. The patterns were all much admired.

The Alterations at the Newcastle-under-Lyme Gas-Works.—The quarterly meeting of the Newcastle (Staffs.) Town Council was held last Friday week, when Mr. Briggs moved that the corporate common seal be affixed to the application to the Local Government Board to borrow £18,344 for alterations and extensions at the gas-works. This would be under the power of the Provisional Order, the objects of which had been explained, he said, not only to the Council, but to the officials of the Local Government Board. It was, of course, not intended that the whole of the money should be spent at once. The alterations would be spread over a series of years, so as not to interfere with the efficient working of the Gas Department. They hoped, however, at the end of the time when the works had been reconstructed, and considerable portions of them had been rebuilt under the provisional estimaes, that they would be able to carry out to the utmost all the demands that were at all likely to arise. The motion was carried.

Proposed Purchase of the Exmouth Water-Works by the Local Board.—At last week's meeting of the Exmouth Local Board, the Roads Committee reported that they thought this was a favourable opportunity for approaching the Water Company, with a view to purchasing their undertaking, or making arrangements for a more efficient supply of water. Mr. Benmore, in proposing that the report be adopted, said he thought they ought to have the water supply in their own hands, and the gas as well. Dr. Kempe, the Medical Officer, stated that he considered the present supply of water totally inadequate to admit of the proper flushing of the sewers at the time when most needed—viz., in the hot and dry months of the year. Also, there was not a sufficient supply to allow it to be taken for the purpose of watering the streets; and consequently sea water had to be used. This, when admitted to the sewers, mixed with the sewage, and set free sulphuretted hydrogen. It was necessary, for the health of the inhabitants to be maintained, that the supply per head should be at least 16 gallons. It appeared, on the face of the above remarks, that the best course open to the Board was to purchase the present water-works, and make additions to increase the supply, which was becoming so urgently needed. The report was adopted, and the further consideration of the matter was referred to a Committee of the whole Board.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

Another attempt was made in the Aberdeen Town Council last Monday to throw discredit upon the new stoking machinery at the Corporation gas-works. The mover in this crusade was the old champion of gas-works grievances, Mr. Pratt, who submitted a motion that it be remitted to the Gas Committee to procure a report from a competent person, to be selected by them, as to the actual saving effected by the new stoking and coal-breaking machinery since its introduction into the Corporation gas-works. In support of his proposition, Mr. Pratt launched into an array of figures, which led to a protest from Bailie M'Kenzie, the Convener of the Gas Committee, that he was forestalling his own motion. Mr. Pratt, however, persisted in his remarks, though subjected to a good deal of interruption; Lord Provost Stewart, for one, remarking that the motion assumed that everyone at the gas-works was incompetent. No one, his Lordship supposed, cared whether a competent person was employed; but at the same time he thought it cast a reflection on the Manager. Bailie M'Kenzie explained that there was nothing at the works that required to be hid; but in the face of such a tremendous speech by Mr. Pratt, which was an injustice to the Manager, himself, and the Committee, he moved the previous question. Mr. Pratt secured a seconder for his motion; but on Mr. Maconnachie proposing that it be remitted to the Gas Committee to procure a report, his seconder withdrew. Bailie M'Kenzie accepted Mr. Maconnachie's proposal; and it became the finding of the Council by 16 votes to 1—Mr. Pratt himself only voting for his own motion. This should show him that he has not the assent of the Council to his recurrent attempts at agitation, attempts which, as the Lord Provost truly said, are not convenient for the Council at all.

The Corporation of Aberdeen have started in pursuit of a veritable "will-o'-the-wisp" in connection with the powers they hold under the Electric Lighting Provisional Order which they obtained in the session of 1890. I recorded in this column a week or two ago how they were struggling to find a way by which they could put their powers in force—not at profit, but without loss. Information as to their plight having been circulated, Mr. John Evelyn-Liardet, an Engineer of London, has seen it to be his duty to don the philanthropic cloak, which seems to sit so gracefully on the shoulders of electric light promoters, and to proceed all the way to Aberdeen to guide the Electric Light Committee into prosperity. It is interesting—perhaps a trifle melancholy—to observe how easily the ordinary press can be caught and led to do service in a matter of this kind. First there came the announcement that Mr. Liardet had arrived from London "in connection with the scheme which he advocates for electric lighting on a large scale." Observe the effect of the rounding off of the sentence with a fine mouth-filling adjective. Then it is stated, in beautifully-poised language, that "Mr. Liardet a short time ago obtained some statistics from Mr. Smith, the Manager of the gas-works, and is of opinion that the conditions in Aberdeen would be highly suitable for the carrying out of his proposal." Next day the public are taken partially into confidence, and informed that Mr. Evelyn-Liardet has patented an automatic self-adjusting system for utilizing the wasted power of running and tidal waters and waterfalls," and that "he contends that . . . with rivers near at hand, the electric light and fire hydrants could be supplied at less cost than gas. As showing the cheapness of the system, it is claimed that the saving which would be effected in producing the power of a 25-horse power steam-engine would amount to £550." On the following day, I suppose on the principle of "keeping the pot boiling," it is announced that the proposal is to construct a dam across the River Dee, three or four miles above the city, to erect the necessary appliances and buildings on an island, with a foot-bridge to the island, and to convey the energy to the city by a cable. The conveying of energy by cable is an old proposal, and one can understand it; but some information might be vouchsafed as to how the fire hydrants are to be worked by this wonderful invention. If it can be made to work fire hydrants, there must be many another service required by humanity to which the ingenuity of Aberdonians could apply it. Who knows but this little discovery of Mr. Evelyn-Liardet's may yet furnish mankind with the means of satisfying their wants without exertion, and usher in the time when, as some scientist has said, they will be able to shed some of their redundant limbs? Perhaps it would be better not to build too high an expectation upon the invention. At all events, a little criticism cannot be objected to. I do not know if Mr. Evelyn-Liardet claims that it is capable of manipulating figures; because if it is not, I am afraid our present methods of calculation are not very favourable to his position. I find, for instance, that it was some time ago concluded that it would be necessary to erect engines of 300-horse power to produce electricity in Aberdeen, at a cost of £2500. To save £550 upon a 25-horse power engine is the saving of £2200 upon every 100-horse power, and, of course, £6600 upon the 300-horse power, which would mean that Mr. Evelyn-Liardet could effect a saving of £4100 upon an outlay of £2500. This is a result so extraordinary that I fear not even an Irish schoolmaster could make it plain to an ordinary intelligence; and so I do not pursue the subject further, except to say that, taking the above into account, and not forgetting the large outlay in constructing the works, to say nothing of whether the Dee—the most fickle of all waters—would tolerate a dam across its path, I fail to see that Mr. Evelyn-Liardet has shown any good ground for believing that he could bring the community of Aberdeen into an El Dorado of light or anything else.

Another instance of the general ignorance which prevails upon matters connected with the gas industry is furnished in a paragraph which has been going the rounds of the newspapers, describing a fire at the Pitlochry Gas-Works. Some timber staging in connection with the rebuilding of a retort-bench caught fire and ignited the roof, which was partially burned. "The fire," the reporter adds, "was observed just in time to avert an explosion." Comment is unnecessary.

The Dundee Water Commission was treated on Thursday to an exhibition of petulance such as is seldom experienced at meetings of public boards. The Commission met to appoint a successor to Mr. James Watson, now of Bradford, in the office of Water Engineer and Manager. When Mr. Watson's resignation in Dundee was intimated last February, Bailie M'Culloch, who was then Convener of the Works Committee, resigned not only the convenership, but also his seat at the Board, with the intention of becoming a candidate for the office. On learning, however, that he had no likelihood of succeeding, the Commissioners having indicated, privately, their willingness to adopt a resolution debarring any of their number from accepting office of any description unless after a year's absence from office, he withdrew his resignation of membership, and retained his seat. The choice of the Commission fell upon Mr. G. S. Baxter, who was Mr. Watson's assistant, and the Works Committee on Thursday recommended that he be appointed at a salary of £300 a year. Bailie M'Culloch, a disappointed man, moved disapproval of the recommendation, and a long controversy ensued, in which the burden of his complaint was that the Commissioners were about to promote a man who had eight or nine years' experience, and to advance his salary four-fold; while they had declined to advance the salary of another official who had been 30 years in their employment, and who had only £120 a year. There was a good deal of difficulty in getting Bailie M'Culloch to adhere to the subject which was before him. When he did conclude his remarks, no one seconded his motion; and Mr. Baxter was accordingly elected to the office. From all accounts, Mr. Baxter is a promising young man, who was trained by Mr. Watson, and who will be likely to continue the policy inaugurated and so successfully maintained by him. The Commissioners are, by this appointment, saving £300 per annum, which is a consideration; and in every way the appointment appears to be a good one.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Information is to hand to-day from Lockerbie, in Dumfriesshire, to the effect that the works and plant of the local Gas Company have now virtually become, or will very shortly become, the property of the Burgh Commissioners, for the benefit of the town, under the provisions of the Burghs Gas Supply (Scotland) Act, 1876. Mr. James M'Gilchrist, Gas Engineer, of Dumbarton, Arbiter for the Lockerbie Gas Company, and Mr. Robert Mitchell, Gas Engineer, of Edinburgh, Arbiter for the Police Commissioners, met in this city yesterday (Friday), along with the local agent in the reference, and fixed the price which is to be paid for the Gas Company's undertaking without requiring to consult any person as umpire. They agreed that the price should be at the rate of £210 per £100 of nominal capital of the Company, which is £2454; the last dividend being at the rate of 12 per cent. The purchase price will actually be £4880. A meeting of the Burgh Commissioners was held on Thursday night, specially with reference to the acquisition of the gas-works. The Clerk reported that he had received an intimation from the two Arbiters saying that they were about to issue their award. Provost Nutt, who presided, considered that the settlement was rather precipitate. He understood that they would have supplied a note of their proposed findings, and convened a meeting of the two parties to the bargain. The Clerk replied that both Arbiters considered that any further meeting was unnecessary. Mr. Edgar inquired what the capital of the Company amounted to; but the Provost replied that the Commissioners did not possess that information, at which Mr. Edgar expressed some surprise. Bailie M'Dougall remarked that the Provost and the Commissioners' agent went over the documents, and they were just as wise when they finished their examination as when they began. Provost Nutt said they must now accept the Arbiters' award. In regard to the necessary capital, the Clerk reported that he had communicated with a Liverpool firm, who were prepared to advance the required amount of money at 3⅝ per cent., which was a fraction less than the rate asked by a London firm with whom there had been negotiations, which had not been closed. On the motion of the Provost, seconded by Mr. Bell, the offer was accepted, and eventually a Committee was appointed to take over the works and see to their proper management

At the monthly meeting of the Kilmarnock Town Council on Thursday night, a report was submitted from the Gas Committee in which it was stated that they had entered into contracts for the supply of 8000 tons of coal for the ensuing season at an average price of 1s. 3d. per ton higher than last year's average price. The balance-sheet for the financial year ending June 14 was submitted, and it showed a profit of £2021 on the year's operations.

Yesterday week the new gasholder, which has been constructed at the works of the Dunoon Gas Company by Messrs. Hanna, Donald, and Wilson, of Paisley, was formally inaugurated by the Chairman (Provost Oswald) in the presence of a large gathering, including Directors and friends. Mr. Donald, of the contractors' firm, presented Provost Oswald with a neatly-wrought silver-mounted key for turning on the gas to the holder. Luncheon was afterwards served in the Argyle Hotel; and several toasts suitable to the occasion were submitted and duly honoured. The work of constructing the holder was carried out according to plans and specifications prepared by Mr. D. Robertson, the Manager of the works.

The Johnstone Gas Commissioners have now in progress and well forward towards completion the last of the important improvements at the gas-works which it is anticipated will be necessary for a number of years. They have been under the necessity of agreeing to borrow a sum of £5400 to carry out the series of important improvements and extensions, which include a gasholder of great capacity. The extensions referred to could no longer be delayed, as at times last winter the town was threatened with darkness, owing to the limited storeage accommodation at the works. The list of improvements also includes a new station meter, together with the erection of sheds for the storeage of coal. When the works were acquired by the Burgh Commissioners, the price paid for them under the arbitration was upwards of £20,000, which has by many experts ever since been regarded as most exorbitant. During the time that the works have been the property of the town, a large amount of money has been expended upon their equipment as a first-class gas-producing establishment. While the various improvements have been going on, the Gas Commissioners have been able at short intervals to reduce the price of gas to consumers; the price at present standing at 3s. 11½d. per 1000 cubic feet, to which it was reduced (from 4s. 4½d.), I think, a year ago.

Under the title of the Carnbrae Chemical Company, there has been

formed a concern, by agreement between Messrs. R. and J. Dempster, of the Gas Plant Works, Newton Heath, Manchester, and Messrs. Merry and Cunninghame, ironmasters, of Carnbrae (Coatbridge), Glasgow, and Glengarnock, to carry on, among other things, the business of extractors of products from blast-furnace gases, tar distillers, &c. The capital is to be £52,500, divided into shares of £52 10s. each. Most, if not all, of the first shareholders hail from Manchester.

Acting upon the common-sense principle of using their own manufacture for power-generating purposes, the Glasgow Corporation Gas Committee have resolved on getting a gas-engine of 15-horse power to drive the machinery in the workshops connected with the Tradeston gas-works. The engine will be of the "Stockport" type, the tender of Messrs. J. E. H. Andrew and Co. having been the lowest.

Messrs. James Ross and Co., tar distillers, of Falkirk, were recently asked, on behalf of the Glasgow Gas Trust, if they were willing to renew for another year the contract which they had for the tar and liquor produced at the works of the Partick, Hillhead, and Maryhill Gas Company during the year ending June 30 last. They replied that they were not prepared to do so on the same terms and conditions as those of the last contract, but that they were willing to take the products, as also those of the Dalmuir Gas-Works, on the same terms and conditions as those of their current contract for the products from the Dawsholm Gas-Works, provided that they were permitted to work the products of the Maryhill Gas-Works at the Dawsholm Chemical Works belonging to the Gas Commissioners, in the event of their making the necessary arrangements for doing so. The Gas Committee have declined to accept the offer as submitted, and have authorized the Manager (Mr. W. Foulis) to obtain and submit tenders for the residual products referred to from several firms.

The Glasgow pig-iron warrant market has not been so idle during the past week as for some time back; and Scotch warrants have ranged in price at and about 47s. per ton cash—the close yesterday afternoon being at that figure. In hematite warrants the fluctuations have been between 48s. 9d. and 47s. 11½d. per ton cash; closing yesterday at 47s. 10½d. The close at the same time for Cleveland warrant iron was 38s. 9d. per ton cash; the range during the week being from 40s. 1½d. down to that price. Trade is no worse, indeed, in some branches, it seems to show a slight improvement, although it is only in tone, not in price. There are now 73 blast-furnaces in actual operation in Scotland, as compared with 78 at this time last year, when the price of Scotch warrants was an average of 48s. 8½d. per ton for the whole of August.

This has been a fairly busy week in the local coal trade; and unless in case of dross, the prices have been well maintained. Main coal has moved off well; but splint coal is only in limited demand.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 8.

Sulphate of Ammonia.—There is very little change in the market—spot quotations remaining at about the same level as last week; but there is a considerable business doing forward in Scotch and London makes, principally for October to March delivery, at £11 to £11 2s. 6d. per ton. The bulk of the buying seems to be of a speculative nature; consumers not generally participating in the operations, which are probably (to some extent, at all events) due to the movement in nitrate of soda. The latter has advanced 5s. to 7s. 6d. per ton; and spot business has been done to-day at 8s. 10½d. per cwt. Sulphate prices are, of course, at a low level; and the sales abovementioned seem rather to indicate that makers have not such a good opinion of the future as the present buyers. There is now, however, very little offering in any position.

LONDON, *Aug.* 8.

Tar Products.—There is very little doing in this market. Benzols continue firm, with a good deal of inquiry; and the same may be said of pitch. The other tar products are not much inquired for, neither are makers offering. Very little is being produced; and most manufacturers are fairly well sold. Anthracene is weak—no doubt in sympathy with the wretched condition of the dyeing trade. To-day's prices may be taken as follows: Tar, 24s. to 29s. Pitch, 34s. 6d. Benzol, 90 per cent., 4s. 1d.; 50 per cent., 2s. 11d. Toluol, 1s. 8d. Solvent naphtha, 1s. 3½d. Crude naphtha, 1s. 2d. Creosote, 1¾d. Carbolic crystals, 6d.; crude, 60's, 1s. 4d. Cresol, 8d. Anthracene, "A" quality, 1s. 4d.; "B" quality, 11d.

Sulphate of Ammonia.—There is undoubtedly a better tone in this market; and sales are not so difficult to bring about. Makers are remarkably free from stocks; and the inquiries from abroad are more general than they have been for some time. Business is reported at prices varying from £10 12s. 6d. to £10 16s. 3d, less 3¼ per cent. discount. Gas liquor is quoted at 4s. to 5s.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

There is no material change to report in the condition of the coal trade throughout the Lancashire district. In the better qualities of round coal, business is moving on very steadily for the time of the year; and prices are well maintained at late rates. In fact, so far as best house-fire coals are concerned, there is really no giving way whatever. The leading Manchester colliery concerns hold firmly to the list rates that were ruling during the winter. In the West Lancashire district, best Wigan Arley is quoted at 12s. to 12s. 6d. per ton; second qualities, 10s. 6d. to 11s.; Pemberton, four-feet, 10s. to 10s. 6d.; and common house-fire coals, 9s. to 9s. 6d. per ton at the pit's mouth. In the lower descriptions of round coal, however, the market shows some weakness, as the natural result of lessening requirements in one of the principal coal-using industries; but, so far as inland sales are concerned, there is no really appreciable giving way upon late rates, although, for shipment, colliery proprietors seem to be pushing surplus supplies at very low figures. At the pit's mouth, good ordinary descriptions of steam coal average about 7s. 3d. to 7s. 9d. per ton for inland sales; but for delivery at the High Level, Liverpool, or at the Garston Docks, steam coal can be readily bought in quantities for shipment at 9s. to 9s. 6d. per ton. During the past week there were holiday stoppages of two or three days at many of the collieries; and this has to some extent temporarily restricted the output. But stocks continue to accumulate, although not to any large extent; and there is still a prospect of some scarcity of supplies for the ensuing winter, if the demand be anything above the average. The chief difficulty with which colliery proprietors have to contend is in respect of engine classes of fuel. In most cases they are able to move off the better qualities of burgy and slack without much difficulty; but inferior sorts are so plentiful, not only in the Lancashire district, but in the neighbouring coal-fields, and are pushed for sale at such extremely low prices, that list rates have been practically abandoned, although there is no actually official reduction in prices. At the pit's mouth, good qualities of burgy fetch from 6s. 9d. to 7s. 3d. per ton; and the best qualities of slack from 6s. up to 6s. 6d. in some cases. Common sorts, however, can be readily bought from as low as 3s. up to 4s. per ton.

Northern Coal Trade.—The coal trade is on the whole steady, with a good demand. Best Northumbrian steam coal is quieter, at from 12s. 3d. to 12s. 6d. per ton, f.o.b. Small steam coal is dull at about 4s. 6d. For gas coal the demand is increasing satisfactorily, both for shipment and for home use; and one or two of the largest producers have put up their prices to 10s. per ton f.o.b. It is, however, no secret that this is partly because their output is so largely taken up by contracts arranged at lower prices. Still, the general tendency of the trade is towards higher prices just now; because much has been sold, and there is also less coal being produced by a given staff at some of the collieries. The Middlesbrough gas coal contracts have been concluded, at about 10s. 6d. per ton delivered; and those for Tynemouth are about settled, at rates that somewhat correspond, when the proximity to the collieries is considered. Very large shipments of gas coal are now being made from Sunderland to London. Bunker coal is quiet, as low as 8s. 6d. having been accepted for unscreened qualities. Manufacturing coal is also dull. Coke is in a little more inquiry, at about 16s. per ton, f.o.b. in the Tyne. There is no alteration in the price of gas coke; but the output is now increasing.

The Malvern Link Local Board and the Gas-Works.—At their meeting last Friday, the Malvern Link Local Board approved the recommendation of the Lighting Committee to offer the Malvern Link Gas Company a definite sum for the purchase of their works. Mr. Yapp pointed out that the amount determined upon had been arrived at by taking the mean between the estimates of two gentlemen acting independently in a careful and detailed inspection of the property; and it was based upon its structural value.

Projected New Gas-Works for Stoke-upon-Trent.—At the last meeting of the Stoke-upon-Trent Town Council, the Gas Committee reported that, having read the report of Mr. Corbet Woodall, C.E., on the gas-works, they recommended the Council to instruct the Town Clerk to take the necessary steps to promote a Bill in Parliament enabling the Corporation to purchase land and erect new gas-works, and particularly to enable the Corporation to supply electrical energy for any public or private purposes, both within and beyond its jurisdiction. In moving the adoption of the report, Alderman Leason remarked that they would soon have to make a radical change in their method of producing gas, or refuse to take any more customers. The Council then proceeded to consider the matter in committee, with the result that the recommendation of the Committee was adopted, after a rather long discussion.

The Gas Supply of Swinton and Pendlebury.—A special meeting of the Swinton and Pendlebury Local Board was held a short time ago to consider the question of the gas supply. The Clerk (Mr. Berry) read a report of the Parliamentary Committee in reference to a recent interview with the Eccles Local Board as to the advisability of promoting a Bill in the ensuing session of Parliament to supply the two districts of Eccles and Swinton with gas, and also those beyond their own boundaries now served by the Salford Corporation. Considerable discussion took place on the report; and it was unanimously resolved that the Board, jointly with that of Eccles, should promote a Bill for the purposes mentioned. The Parliamentary Committee further reported that the Barton Rural Sanitary Authority and the Little Hulton Local Board had been asked to join in the movement, and in the purchase of the interests of the Salford Corporation.

Skipton Water Supply.—Last Friday a special meeting of the members of the Skipton Local Board was held, under the presidency of Mr. J. B. Dewhurst to pass a resolution asking the ratepayers to sanction the promotion of a Bill to construct water-works capable of supplying 110 million gallons, at an estimated cost of £40,000. The Chairman strongly advocated the Skibeden scheme, as being the one most applicable to the town's requirements; and he refused to have anything to do with the alternative scheme presented by the Ratepayers' Association, by which it is intended to construct a reservoir at Eastby. Mr. G. M. Robinson ridiculed the idea of the Board attempting to provide a reservoir for a population of 25,000 to 30,000 people; and he complained of no statement having been made as to the price to be paid to Lord Hothfield, through whose estate the conduits would pass, for the land required. The Chairman replied that the terms of the purchase of the land would, when the negotiations were completed, be satisfactory to the Board. Mr. Robinson again commented upon the refusal of Lord Hothfield to permit the Cawder Gill water to be brought into the existing reservoir to enhance the present supply, and thus stave off for many years to come the necessity for an enlarged scheme. The action of his Lordship was defended both by the Chairman and the Vice-Chairman of the Board. The resolution was carried—eight voting for it, and four remaining neutral.

The Rating of the Barnstaple Water-Works.—At the Barnstaple Quarter Sessions, on the 30th ult., the Recorder (Sir G. S. Baker, Bart.) had before him an appeal by the Barnstaple Water Company against the rating of their property by the Assessment Committee of the Union. The rateable value of the property was £500; and this had been raised by the Committee to £900—the reason assigned being that this figure ought to be something like the dividend received by the shareholders, which last year was £1600. Mr. T. Hawksley, for the Company, put the value at £389; Mr. W. Sturge, a surveyor, of Bristol, at £442. For the Assessment Committee, Mr. Mason (of Messrs. Hedley, Mason, and Hedley, of Birmingham), calculated the real rateable value at £952; Mr. T. Dinwhiddy, at £1035. With these divergent figures before him, the Recorder has reserved judgment.

York New Water-Works Company.—The half-yearly meeting of this Company was held last Thursday—Mr. J. F. Taylor in the chair. The Directors, in their report, recommended dividends of 5s. per share on the preference shares, 9s. per share on the ordinary shares, and 6s. 3d. per share on the new shares, 1878 and 1879, for the past half year, without deduction for income-tax. In moving the adoption of the report, the Chairman said the Company had made their dividend; and this was very satisfactory after all the heavy expenses to which they had been put in opposing the Bradford Water Bill. They now paid 9 per cent.; and he hoped that in a few more half years they would be able to hand over 10 per cent.—the maximum allowed. It was the anxious endeavour of the Directors to provide the city with a pure and wholesome water supply. The report was agreed to, and the dividends recommended were declared.

The Vyrnwy Aqueduct.—We have received from Mr. G. F. Deacon, M. Inst. C.E., Engineer of the Vyrnwy Water-Works of the Liverpool Corporation, a letter contradicting the statement which has lately been made in certain daily papers to the effect that a large proportion of the water passing through the Vyrnwy Aqueduct is lost in the River Mersey, and consequently never finds its way into Liverpool. Mr. Deacon says: "The Vyrnwy aqueduct, including the temporary steel pipes under the Mersey and their flexible joints, is remarkably water-tight; and the temporary pipes are answering admirably the purpose for which they were intended. Any excess of supply from Lake Vyrnwy over and above that which reaches Liverpool, is to be found in the intermediate reservoirs, or at prescribed points of overflow. The contracted pipe beneath the Mersey conveys to Liverpool all the water it is calculated to convey under the existing conditions of head—all, indeed, that is wanted. If more comes towards it, the excess naturally overflows at one of the reservoirs on the aqueduct."

An Electric Lighting Scheme for Helston.—At the recent quarterly meeting of the Helston Town Council, the proposed electric lighting of the borough was further discussed. Mr. J. E. Veale, of St. Austell, presented a report on the subject, in compliance with the request of the Special Committee which had been appointed to consider it. He declared that it was quite possible to light the town by electricity, and that the present disposition of the town lighting would adapt itself well to the new illuminant. The Council might use either water power, a gas-engine, or an oil-engine. The cost of the installation would be £2070 if water power were employed, £1724 with gas, or £1590 with an oil-engine. The distance of the water supply (at Lowertown) was a disadvantage; it would necessitate the laying of a mile and a quarter of underground mains. The annual expenditure with water power he estimated at £198 10s.; gas, £192 4s.; and oil, £185 10s. The estimate was for 110 lights—70 street lamps, and 40 in the market-house, &c.—with the necessary plant and street cables; and he guaranteed that the system should be in working order in six months. Should a demand arise for a considerable number of private lamps, he promised that the cost of the public lighting would be reduced. After some discussion, Mr. Dale moved that the Council decide upon lighting the borough by electricity, and that water power be used for the purpose, the details to be left to a Committee. The Mayor said the resolution, if passed, would involve the borough in very serious liabilities; so if no one else would move in the matter, he should propose that the consideration of the matter be deferred. This suggestion, however, was defeated by seven votes to two; the resolution being carried. It was further resolved that, unless the Gas Company materially reduced the price of the gas supplied for street lighting during the coming winter, oil-lamps should be substituted.

Progress of the Manchester Water-Works.—On the 31st ult., the members of the Manchester City Council visited the water-works of the Corporation in Longdendale, under the guidance of the Chairman of the Water Committee (Alderman Sir John Harwood), the Deputy, Chairman (Mr. B. T. Leech), and the Engineer (Mr. G. H. Hill). The company first inspected the Woodhead reservoir, at the head of the valley, which receives the water at the source of the River Etherow, and also the Heyden Brook and other tributary streams which flow down the Heyden Valley on the Cheshire side. The area of the reservoir is 135 acres; its depth, 71 feet; and its capacity, 1181 million gallons. The height of the top water level above Ordnance datum is 782 feet. Thence proceeding down the valley, the visitors viewed the Torside reservoir, which forms the largest of the series. Its height is 651 feet; its area, 160 acres; its depth, 84 feet; and its capacity, 1474 million gallons. The next to be visited—the Rhodes Wood reservoir—was interesting, as it is used for storing the clear spring water for supplying the city. Its height is 574½ feet; its area, 54 acres; its depth, 68 feet; and its capacity, 500 million gallons. At all of these the many details by which the water supply is controlled, and the manner of its conveyance, were pointed out. The reservoirs at Vale House and Bottoms, each having its own special interest, were also inspected; and the journey was concluded at Arnfield. On the 13th of July, according to an official report made by Mr. Hill, the quantity of work completed in the various sections of the aqueduct, which are dealt with under eight separate contracts, was some 86 or 87 per cent. It may be taken for granted that by this time the proportion has been raised to something like 90 per cent. of the whole. It is calculated that by the end of the year the aqueduct will be completed along its full length of 95 miles 1364 yards. The works at Thirlmere are not included in this calculation.

The Increase in the Price of Gas in Liverpool.—At the meeting of the Liverpool City Council last Wednesday, Mr. J. B. Smith called attention to the letter of the Watch Committee to the Gas Company asking for some reason for the price of gas being increased. He said the Council must be well aware that the relations between the Company and the Corporation were settled by Act of Parliament, which gave the latter the right to audit the accounts of the Company, to appoint an inspector to see that the gas supplied to the public lamps was up to a certain standard, and that justice was done to the public. He thought it rather strange that the letter in question should be written to the Company, because there was no suggestion that they had not done their duty. Why should the Committee be surprised at the action of the Company? The Directors and shareholders of the Company were just as much concerned in getting cheap gas as anybody else. Of course, it was perfectly natural that a person should not like to pay more for an article than that for which he had been getting it for a long time. Before the Council confirmed the letter to which he took exception, he wished to remind them of an old proverb: "Those who live in glass houses should not throw stones." The Corporation were in a similar position to the Company. They were bound to supply water; and if it should become necessary to raise the price, what would the Water Committee think if the Local Boards around wrote them a letter asking why they increased it? Mr. J. Miles said it was not fair to compare the Water Committee with the Gas Company. The Committee did not pay 10 per cent. on the capital raised. Mr. Smith said the dividend was 4½ per cent. on the capital; and the Company took the risk of gas being superseded. Mr. Duncan said he took the bulk of the responsibility for the letter. The Watch Committee, as the representatives of the general body of ratepayers, who paid £40,000 a year for lighting the city, were justified in inquiring into the matter. Manchester, which was close to Liverpool, paid only 2s. 6d. per 1000 cubic feet for its gas; and the South Metropolitan Company of London charged only 2s. 3d. per 1000 feet, and paid a dividend of 13 per cent. In the face of these facts, he thought the Committee were right in taking some notice of the increase in the price of gas from 2s. 8d. to 3s. in Liverpool. He admitted that the Company were bound to raise their price; but the Committee were equally entitled to ask why they did so.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 250.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	17–18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	11½–12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	104–106	..	4 14 2
100,000	20	28 May	8	Bahia, Limited	20	14–16	..	10 0 0
200,000	5	13 May	7½	Bombay, Limited	5	6¾–7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4¾–5¼	..	5 14 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	420–225	..	5 8 10
125,000	,,	,,	9½	Do. New	100	160–164	..	5 12 10
220,000	20	12 Mar	11½	Brighton & Hove Original	20	40–42	..	5 9 6
320,000	20	10 Apl.	11½	British	20	44–46	..	4 17 10
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18–20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13–15	..	5 6 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7–8	–½	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90–95	..	6 6 4
150,000	20	26 Feb.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	10 Apl.	13¾	Commercial, Old Stock	100	255–265	..	5 3 9
130,000	,,	,,	10½	Do. New do.	100	190–200	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119–124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	225–235	–5	4 5 1
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190–200	..	3 10 0
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	200–205	..	4 17 7
486,090	10	15 July	10	European, Limited	10	20–21*	..	4 15 3
354,660	10	,,	10	Do. Partly paid	7½	14½–15½*	..	4 16 9
5,470,640	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	238–243	–1	5 7 0
100 000	,,	,,	4	Do. B, 4 p. c. max.	100	96–99	..	4 0 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	258–263	..	3 16 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120–125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175–180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	162–166	..	4 4 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	254–259	..	3 17 3
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	155–160	..	3 15 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112–115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120–125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163–168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	229–234	+1	5 2 7
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼–4¾	..	6 6 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	111–113	..	4 8 6
541,920	20	11 June	6¼	Monte Video, Limited	20	15–17	..	7 12 11
150,000	5	28 May	10	Oriental, Limited	5	8–8½	..	5 17 8
60,000	5	25 Mar.	7	Ottoman, Limited	5	4½–5¼	..	6 7 3
166,870	10	26 Feb.	2	Pará Limited	10	2¾–3¼	..	—
420,000	100	4 May	6	People's Gas of Chicago—				
500,000	100	1 June	16	1st Mtg. Bds.	100	92–97	..	6 3 9
150,000	10	28 Apl.	10	2nd Do.	100	90–95	..	6 6 4
500,000	Stck.	26 Feb.	15½	San Paulo, Limited	10	13–15	..	6 13 4
1,350,000	,,	,,	12	South Metropolitan, A Stock	100	285–290	..	5 6 11
166,500	,,	,,	13	Do. B do.	100	242–247	–1	4 17 2
678,000	,,	26 June	5	Do. C do.	100	242–250	..	5 4 0
60,000	5	12 Mar.	11½	Do. 5 p. c. Deb. Stk.	100	140–144	+1	3 9 6
				Tottenham & Edm'nton, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	260–265	..	3 15 6
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	210–215	..	3 14 5
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138–143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	106–110	–1	3 12 9
708,000	Stck.	12 Feb.	10½	Kent	100	265–270	..	3 17 10
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	233–238	..	3 19 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	192–197	..	3 16 2
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118–123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	347–352	..	3 8 10
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123–126*	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	164–169	–1	3 16 11
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160–165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex	100	250–255	..	3 18 5

* Ex div.

York United Gas Company.—The half-yearly general meeting of this Company was held last Thursday—Mr. J. F. Taylor in the chair. The Directors, in their report, stated that there was a sum of £7583 carried to the profit and loss account, of which £6800 was available for division; and they recommended dividends at the rates of 5s. per share on the old shares, and 4s. 6d. per share, or 5 per cent. per annum, upon the new shares, free of income-tax. They added that the general business of the Company was making satisfactory progress; the consumption of gas showing an increase of 7 per cent. on the six months ending June 30 last—about double the usual average. In moving the adoption of the report, the Chairman said there was a balance in hand of £7583; leaving £417 in hand after paying a dividend of 5 per cent. and the interest on mortgage. Last half year the profits were £2310 less than the amount required for dividend; so that, taking the two half years together, there was a deficiency of £1893, which had to be taken from the reserve fund. The Directors felt that they might congratulate the shareholders on the low price of gas—2s., 2s. 1d., and 2s. 3d., according to the quantities consumed; especially considering that many gas companies had been compelled to raise their charges. The report was adopted. The Chairman then moved a resolution declaring the dividend; and it was agreed to.

Price: Morocco, Gilt, 18s.; Cloth, 15s.; Delivered Free.

THE FIFTH EDITION OF

NEWBIGGING'S HANDBOOK

FOR

Gas Engineers and Managers,

Price 3s. 6d. post free (76 Pages, Demy 8vo., Limp Cloth),

THE

VALUATION OF GAS-WORKS FOR ASSESSMENT,

By THOMAS NEWBIGGING, M. Inst. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

WALTER KING, 11, Bolt Court, Fleet Street, E.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

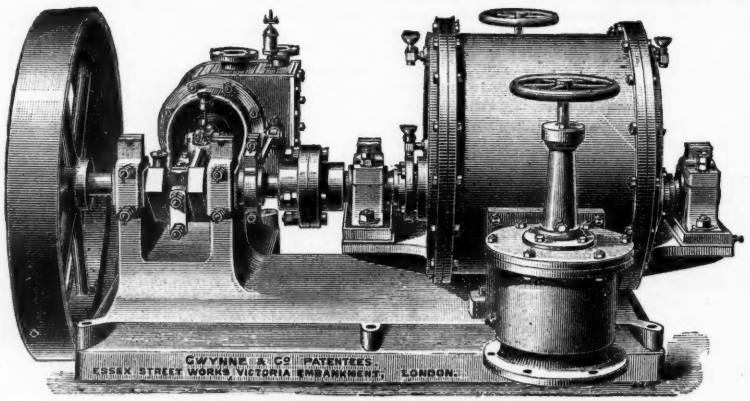
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES HYDRAULIC REGULATORS, VACUUM GOVERNORS STEAM-PUMPS for Tar Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.

Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.

City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.

LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,

Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 278 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 229.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

MR. ALFRED KITT, Consulting Engineer, 5, VICTORIA STREET, WESTMINSTER, late Engineer of the Pimlico and Westminster Stations of The Gaslight and Coke Company.

RAILWAY TANK-WAGONS of full capacity for Tar or Liquor, to be let or sold.

Address No. 1986, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.

120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.

D. M. NELSON AND SONS, GLASGOW. Telegraphic Address: "Gas Glasgow." Depôts throughout England and Scotland.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTS' MOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 95, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.

Head Office: MIDDLESBROUGH. Correspondence invited.

MEIKLEJOHN'S PATENT IMPROVED SLIDE-VALVE ANTI-DIP.

DURING the illness of Mr. Neill Meiklejohn, Sole Patentee and Manufacturer of the above, all communications should be addressed to C. MEIKLEJOHN, Gas Engineer, OLDBURY.

WANTED, by a young Man, a Situation as FITTER in a Gas-Works. Able to do fitting in Iron or Compo., lay Services, fix Meters and Cooking-Stoves, and willing to be generally useful.

Apply to the MANAGER, Gas-Works, Romsey, HANTS.

TO GAS COMPANIES.

WANTED, by a thoroughly experienced man, a situation as METER INSPECTOR and Outdoor FOREMAN of FITTERS. Understands the repairing of both Wet and Dry Meters. Excellent references.

Address No. 1988, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A CIVIL ENGINEER near Liverpool, who is now carrying out important Public Works, has a VACANCY for an ARTICLED PUPIL. Premium required.

Address No. 1987, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

STOKER Wanted, for a small Gas-Works. Must be strong, active, and used to working Engine and Exhauster. Good reference indispensable. Wages, 33s. per week.

Apply to the Manager, Barking Gas-Works, Barking, Essex.

GAS MANAGER WANTED.

MANAGER wanted by the Gas Com-missioners of the Burgh of Kirkcudbright. Salary £130, with free House and Coal.

For further information, apply to John Gibson, Town Clerk, Kirkcudbright, with whom applications, with copies of testimonials, are to be lodged on or before the 18th of August, 1891.

COLCHESTER CORPORATION WATER-WORKS.

WANTED, a good practical Fitter, accustomed to Main and Service laying, fixing Meters, &c. Applicants must be certificated Plumbers, and accustomed to the routine work of a Water-Works. Wages 35s. per week.

Applications (marked "Fitter"), stating age, previous experience, &c., to be sent to me, the undersigned, not later than Saturday, the 22nd of August, 1891, together with not more than three original testimonials of recent date.

Chas. E. Bland,
Superintendent.

Offices: 12, Crouch Street,
Colchester, Aug. 6, 1891.

COUNTY BOROUGH OF HUDDERSFIELD.

THE Town Council of Huddersfield are prepared to receive applications for the office of ASSISTANT GAS-WORKS MANAGER.

Salary, £300 a year.

A statement of the duties and conditions of appointment may be obtained from me on and after the 6th of August next.

Applications, in candidate's own handwriting, accompanied by not more than three testimonials (copies only), and written on paper of foolscap size, should be addressed to me, endorsed "Assistant Gas Manager," and must be delivered not later than Saturday, the 29th of August, 1891,

By order,
H. Barber, Town Clerk.

Town Hall, Huddersfield,
July 29, 1891.

BOG ORE.

A LARGE quantity of Bog Ore for Sale, delivered at Dublin or any English Port.

Thomas E. Potterton, Baskinagh House, Athboy, Co. Meath.

WYE (KENT) GAS-WORKS.

TENDERS are invited for the supply of 150 tons of really good GAS COAL, to be delivered to Wye Station—50 tons at once, and the remainder (as the Company may direct) by May, 1892.

Quotations to be sent early to

W. Lewin, Secretary.

HARTLEPOOL GAS AND WATER COMPANY.

TO GASHOLDER MAKERS.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction and erection of a GASHOLDER, 150 feet in diameter and 30 feet deep, together with STANDARDS, GIRDERS, TIE RODS, &c., connected therewith, and the fixing and completion of the same at their Works at West Hartlepool.

Plans and specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans and specification.

Tenders, on form prescribed, sealed, and endorsed "Tender for Gasholder," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 2nd day of September next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
Thomas Trewhitt,
Secretary.

Gas and Water Company's Offices,
West Hartlepool, Aug. 1, 1891.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Gloucester Gas-light Company invite TENDERS for the surplus TAR produced at their Works for One, Two, or Three years, from the 1st day of October next.

The Tar will be delivered into Boats or Barges at the Company's Wharf, on the Gloucester and Berkeley Canal.

Offers to be at per ton of 200 gallons.

Payments, cash monthly.

Further particulars may be obtained on application to Mr. R. Morland, the Company's Engineer.

Sealed tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, Eastgate, Gloucester, to be delivered not later than Tuesday, the 25th day of August inst.

The Directors do not bind themselves to accept the highest or any tender.

By order,
William E. Vinson,
Secretary.

Gas Offices, Gloucester, Aug. 6, 1891.

TO TAR DISTILLERS, ETC.

THE Directors of the Sheffield United Gaslight Company are prepared to receive TENDERS for the purchase of the surplus TAR made at their Neepsend and Effingham Street Works for the period of Twelve months, ending Aug. 31, 1892.

The quantities will be, approximately: Neepsend, 7000 tons; Effingham Street, 1500 tons.

At Neepsend the Tar will be loaded into tanks on the Company's Siding, on the Manchester, Sheffield, and Lincolnshire Railway, or into Barrel-Carts on the Works, and at Effingham Street, into Barrel-Carts only.

Forms of tender and conditions of contract may be obtained from the undersigned, to whom tenders, endorsed "Tender for Tar," must be delivered on or before Wednesday, Sept. 2.

The Directors do not bind themselves to accept the highest or any tender.

Hanbury Thomas,
General Manager.

Commercial Street, Sheffield,
Aug. 7, 1891.

CORPORATION OF ROTHERHAM.

TAR CONTRACT.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works, for the period of Twelve months, from the 1st day of September, 1891.

The estimated quantity of surplus Tar is about 500 tons.

Sealed tenders must be sent in to me not later than Tuesday, the 18th inst., stating price per ton at the Works, endorsed "Tender for Tar."

The Works are about 550 yards from the Rotherham Midland Station, 440 yards from the Manchester, Sheffield, and Lincolnshire Station, and 350 yards from the Canal Wharf.

Further information and form of tender may be obtained on application to the Secretary, at the Works.

No tender will be considered if not made on the proper form.

The Committee do not bind themselves to accept the highest or any tender.

By order,
H. H. Hickmott,
Town Clerk.

Council Hall, Rotherham,
Aug. 7, 1891.

CORPORATION OF ROTHERHAM.

AMMONIACAL LIQUOR CONTRACT.

THE Gas Committee are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Gas-Works during Twelve months from the 1st day of September, 1891.

The estimated quantity is about 450,000 gallons of 8-oz. strength, as tested by Twaddel's Hydrometer.

Sealed tenders must be sent to me (stating price per 100 gallons at the Works, according to the strength of the Liquor) on or before Tuesday, the 18th inst., endorsed "Tender for Liquor."

The Works are about 550 yards from the Rotherham Midland Station, 440 yards from the Manchester, Sheffield, and Lincolnshire Station, and 350 yards from the Canal Wharf.

Further information and form of tender may be obtained on application to the Secretary, at the Works.

No tender will be considered if not made on the proper form.

The Committee do not bind themselves to accept the highest or any tender.

By order,
H. H. Hickmott,
Town Clerk.

Council Hall, Rotherham,
Aug. 7, 1891.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the surplus TAR produced during the next Twelve months from Sept. 1.

Sealed tenders to be sent in, addressed to the Chairman, by the 21st of August.

Particulars may be obtained from the undersigned, at the Gas Office.

John Chew,
Gas Engineer.

Blackpool, Aug. 6, 1891.

BOROUGH OF CHORLEY.

TO CHEMICAL MANUFACTURERS AND OTHERS.

THE Chorley Corporation invite Tenders for the supply of about 100 tons of SULPHURIC ACID, made from Brimstone, during a period of One year from the 1st of September next.

Tenders, endorsed "Vitriol," accompanied by samples, to be sent to me before Three o'clock on Wednesday afternoon, the 19th of August inst.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
Thos. A. Jackson,
Town Clerk.

Town Hall, Chorley,
Aug. 6, 1891.

SMETHWICK LOCAL BOARD OF HEALTH.

TO TAR CONTRACTORS.

THE Gas Committee invite Tenders for the purchase of the surplus TAR produced at their Gas-Works, Rabone Lane, Smethwick, for a period of One, Two, or Three years, commencing on the 1st of October next.

Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar," to be delivered to the undersigned at the Gas Offices, Public Buildings (where conditions of contract and forms of tender can be obtained), not later than the 27th of August inst.

The Committee do not bind themselves to accept the highest or any tender.

W. J. Sturges,
Secretary.

Smethwick, Aug. 8, 1891.

BOROUGH OF BURTON-UPON-TRENT.

NEW TAR AND LIQUOR TANK.
CONTRACT No. 10.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the supply, construction, and fixing of a new CAST-IRON TAR AND AMMONIACAL LIQUOR TANK, and the execution of the works incidental thereto.

Full particulars and copies of conditions, specification, and bill of quantities, with form of tender, may be obtained and the drawings viewed, on payment of Two Pounds (which will be returned on receipt of a *bonâ fide* tender), on application to the Gas Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.

Sealed tenders, endorsed "Tar and Liquor Tank," are to be delivered to me at or before Ten a.m. on Saturday, the 29th of August inst.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

T. N. Whitehead,
Town Clerk.

Burton-upon-Trent,
Aug. 5, 1891.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE BY TENDER
OF
500 ORDINARY SHARES OF £10 EACH;

Being a portion of additional Capital authorized to be raised under the powers of The Croydon Gas Act, 1877.

MINIMUM PRICE—£22 PER SHARE.

THE Directors give Notice that they will be prepared to receive, not later than Eleven o'clock on the Morning of Wednesday, the 26th of August, 1891, sealed TENDERS for 500 ORDINARY SHARES of £10 each, to be paid up in full on or before the 30th day of September, 1891, and to bear Dividend from that date.

The last Dividend paid upon this class of Shares was at the rate of 11 per cent. per annum.

One £10 Share or any number of the Shares can be tendered for.

Printed particulars and conditions of sale and form of tender may be obtained at the Offices of the Company, Katharine Street, Croydon.

William J. Russell,
Secretary.

July 30, 1891.

Now Ready, Price 6s., bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

The matter composing this book consists mainly of articles written for, and published in, the Journal. The preface says: "In view of new processes that seem to fall in thick and fast one on the other, it has been several times suggested that they should be collected together, so as to form a record of the various gas-making processes that have been proposed in the past, together with some account of the natural laws that govern the manufacture and supply of Illuminating Gas."

The work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation Condensation; and Purification.

LONDON: WALTER KING, 11, BOLT COURT FLEET STREET, E.C.

COLNEY HATCH GAS COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Thursday, the 3rd day of September next, at Six o'clock in the Evening precisely, to receive the Report of the Directors, and the Accounts of the Company for the Half Year ended the 30th of June last, to declare Dividends, to appoint an Auditor, and for other purposes.

By order,
W. H. HARDY, F.C.A.,
Secretary.

August, 1891.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Friday, the 28th day of August, 1891, at Two o'clock in the afternoon precisely, when the following Resolution will be submitted—viz.: "That this Meeting be adjourned till Thursday, the 24th day of September, 1891."

AND NOTICE IS HEREBY GIVEN that the ADJOURNED ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Thursday, the 24th day of September, 1891, at half-past Twelve o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June, 1891, to declare a Dividend, and to transact the General Business of the Company.

The Transfer Books will be closed from the 11th to the 24th of September, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Aug. 4, 1891.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is hereby given, that the FORTY-NINTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room at the Works, Mitcham, in the County of Surrey, on Tuesday, the 25th day of August, 1891, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and for General Business.

The Transfer Books will be closed from the 11th inst. until after the meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works, Merton Lane,
Mitcham, Aug. 6, 1891.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

THE
GUIDE-FRAMING OF GASHOLDERS
AND OTHER PAPERS
CHIEFLY RELATING TO
STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.
BY
F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

HEBBURN MAIN GAS COALS.

Produce of Gas per ton - - - - - - - 10,500 feet.
" Coke " - - - - - - - 13½ cwt.
Illuminating Power - - - - - - - - 16 candles.

For Prices, f. o. b. Ship or delivered, apply to
W. RICHARDSON,
Hebburn Colliery Offices, NEWCASTLE-on-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

JAMES NEWTON & SONS,
(Established 1820)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY and every Article suitable for
GAS AND WATER WORKS.

PATENTS FOR INVENTIONS,
REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*
J. C. CHAPMAN,
Assoc.M.Inst.C.E., M.Inst.M.E., Fel. Inst. Patent Agents,
70, CHANCERY LANE, LONDON, W.C.
Special experience in Gas and Ammonia Plant.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

THOMAS TURTON AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.
PARIS DEPOT: 8, BOULEVARD DE BELLEVILLE.

NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

FIRE-BRICKS. ✣
✣ FIRE-CLAY.
JAMES WHITE & Co., Limited,
Albert Oil-Works,
WIDNES, LANCASHIRE,
Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THOMAS LIGHTING Co., LTD.,
15, CARTHUSIAN ST.,
LONDON, E.C.

Manufacturers of the "Thomas" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

CAST-IRON PIPES
FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES
FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

Wrought-Iron
TUBES
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, Short Street, LAMBETH.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.
☞ Retort Setters sent to any part of the Kingdom.

SPENT LIMES NO LONGER WASTE PRODUCTS.
Under G. R. HISLOP'S PATENTS

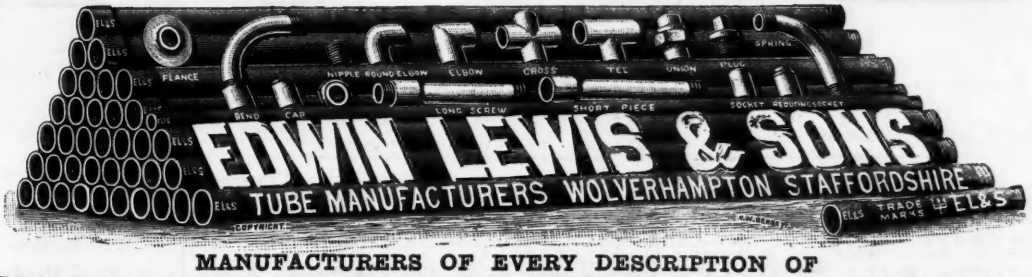
All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —
Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,
Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

ESTABLISHED 1825.

GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF
IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES
FOR ANY PURPOSE.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS, "GAS, LEEDS." — LONDON OFFICE, 60, QUEEN VICTORIA STREET, E.C.

CLAYTON, SON, & Co.

LIMITED,

LEEDS,

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

BEST

GAS COAL.

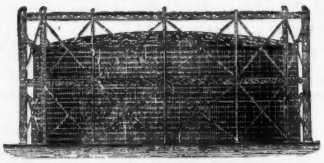
REAL OLD SILKSTONE GAS COAL,

Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

W. C. HOLMES & CO., WHITESTONE IRON-WORKS, HUDDERSFIELD,

Makers of the

PATENT SCRUBBER-WASHER
PATENT EXHAUSTERS,
PATENT ANTI-DIP PIPES,
BROOK'S GAS PRODUCER.



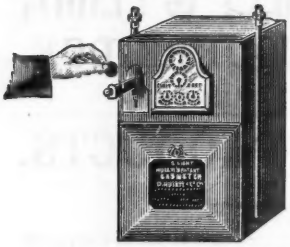
GASHOLDERS, ALL SIZES,
PURIFIERS, SCRUBBERS,
CONDENSERS, AND VALVES
OF EVERY KIND.

London Office: 80, CANNON STREET, E.C.

Illustrated Catalogues on Application.

PREPAYMENT GAS-METER.

(PRICE'S PATENT.)



This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.
NO RISK OF BAD DEBTS.

PROPRIETORS AND MANUFACTURERS:

D. HULETT & Co., LIMITED,

GAS-METER MAKERS, 55 & 56, HIGH HOLBORN, LONDON.

JOHN BROTHERTON, LIMITED,

IMPERIAL TUBE WORKS,

WOLVERHAMPTON,

Paris Exhibition 1867.
Amsterdam Exhibition 1883.
Silver Medal and First-Class Certificate
Bronze Medal and Special Diploma
Adelaide Exhibition 1887.
First Order of Merit and Medal.

MANUFACTURERS OF
WELDED IRON TUBES AND FITTINGS
FOR GAS, STEAM, WATER, &c.
LAP-WELDED TUBES
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.
HYDRAULIC AND HOT-WATER TUBES.
COILS OF ALL SIZES AND SHAPES.
Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

Paris Exhibition 1867.
Calcutta Exhibition 1883 *and* 1884.
Silver Medal and First-Class Certificate.

London Offices: 3, Jeffrey Square, St. Mary Axe, E.C.

Telegraphic Address: "BROTHERTON, WOLVERHAMPTON."

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL
AND GAS COALS.

Quotations and Analysis on application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

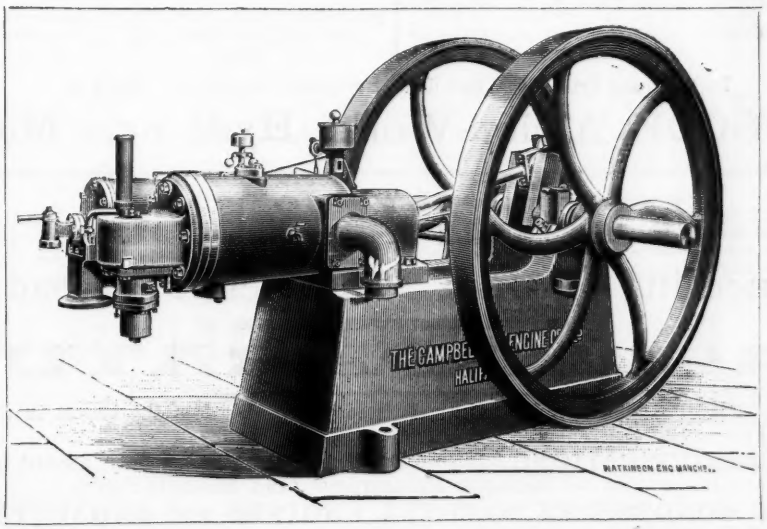
EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
Coal Owners, Newcastle-on-Tyne,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

THE "CAMPBELL" GAS-ENGINE,

MOST SIMPLE AND MOST EASILY MANAGED.



MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E.; at the Sydenham Gas-Works; Tiverton Gas-Works; Filey Gas-Works, &c.

Prices and full particulars from the sole makers—

THE CAMPBELL GAS-ENGINE CO., LTD., HALIFAX, ENGLAND.
LONDON: 114, TOOLEY STREET, S.E. GLASGOW: 111, WEST GEORGE STREET.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X O	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations–

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

PATENT RIVET COMPANY, LTD., SMETHWICK, NEAR BIRMINGHAM.

Established 1843.

TELEGRAMS: "PRIVET, BIRMINGHAM."

MANUFACTURERS OF

BOLTS & NUTS
FOR
PIPE JOINTS,
FLANGE JOINTS,
RETORT MOUTH-PIECES,
SCRUBBERS,
CONDENSERS,
PURIFIERS,
SIEVES, TANKS,
ENGINES,
BOILERS,
&c., &c.

RIVETS
FOR
GASHOLDERS,
BOILERS,
GIRDERS,
TANKS,
COVERS,
&c., &c.; ALSO
SET SCREWS,
WASHERS,
SPIKES,
AND
FISH PLATE BOLTS.

D. HULETT & CO., LTD.,

GAS ENGINEERS,

55 and 56, HIGH HOLBORN, LONDON,

Manufacturers of every description of Gas-Fittings.

HULETT'S PATENT STREET-LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of best material.

WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

Advantages attending its use are:

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE. The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

MAKERS OF COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY, COKE BREAKING AND WASHING MACHINERY.

Sole Makers of CIRCULAR, OVAL, or Ω-shaped **MOUTHPIECES** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

West's Improved Combined Regulating Liquor Seal Valve.

OXIDE ELEVATING MACHINERY, COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT, &c.

Illustrated Catalogue sent upon application.

Mr. JOHN WEST, M. Inst. C.E., *Managing Director.*

Complete in Three Volumes. Price £4 4s., handsomely bound in Morocco, cloth sides, gilt edges.

KING'S TREATISE on the SCIENCE & PRACTICE OF THE MANUFACTURE & DISTRIBUTION OF COAL GAS.

Edited by THOMAS NEWBIGGING, C.E., M. Inst. C.E., and (the late) W. T. FEWTRELL, F.C.S.

[To enable those who purchased the first two volumes in parts to have the binding of the third Volume to match, sheets (price 22s.) can be had on application to the Publisher.]

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Gas-Bags for Mains. **High-Water Boots.** **Woollen Miners' Jackets.**

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber, and Stokers' Gloves.

Write for Price List to

THOMAS BUGDEN, Manufacturer,
116 & 118, GOSWELL ROAD, LONDON, E.C.

HANNA, DONALD, & WILSON,

(Established 1851),

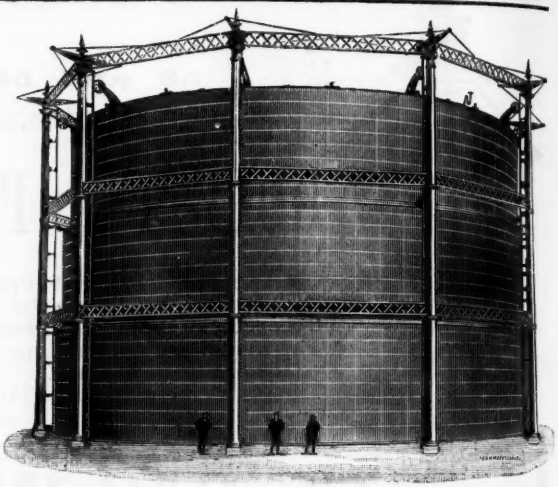
GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,

MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.



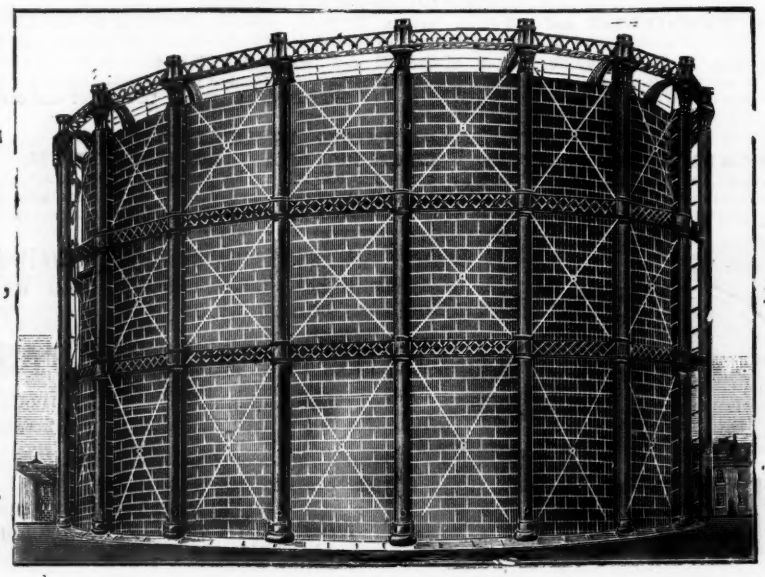
Telegraphic Address: "Donald Paisley."

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF **GAS HOLDERS & GAS PLANT,**

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF
STRUCTURAL IRON
AND STEEL WORK,
BRIDGES,
ROOFS,
PIERS, ETC.



WORKS & HEAD OFFICE:
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON.
"GALILEO, LONDON."

HENRY BALFOUR & CO.,

LEVEN, FIFE,

MAKERS OF

GASHOLDERS

And all Classes of GAS PLANT,

REVOLVING BRUSH SCRUBBERS, FOUR-WAY VALVES.

LONDON: 13, BILLITER STREET, E.C.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS,

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

GEO. SHEPARD PAGE,

Of 69, Wall Street, New York, U.S.A.,

For thirty years closely identified with the Gas Industry in North and South America, and having a wide personal and influential acquaintance with Gas Managers, is desirous of opening negotiations with gentlemen in Great Britain and on the Continent who own or control new Inventions or Systems applicable to Gas Purification, Gas Consumption, and the Utilization of Gas Residuals, Ammonia, Tar, and Sulphur. He refers by permission to

GEORGE BOWER, Esq.,
Gas Engineer, St. Neots, England.

SIDNEY HERSEY, Esq.,
Secretary, Messrs. Kirkham, Hulett, and Chandler, Limited, London.

WALTER KING, Esq.,
"Journal of Gas Lighting," London.

WILLIAM YOUNG, Esq., and GEORGE BEILBY, Esq.,
Of Young and Beilby, Edinburgh.

THOMAS TURNER, Esq.,
President and Engineer Charleston (South Carolina) Gas Company, President American Gaslight Association.

GENERAL ANDREW HICKENLOOPER,
President Cincinnati Gas Company (Ohio), President Board of Trade Cincinnati, Ex-Lieutenant Governor of Ohio.

COLONEL JOSEPH R. THOMAS,
Editor "American Gaslight Journal," and President Society of Gas Lighting, New York.

GEORGE A. M'ILHENNY, Esq.,
President Washington Gas Company (District of Columbia).

W. H. PEARSON, Esq.,
General Manager and Secretary, Toronto Gas Company, Canada.

COLONEL WM. A. STEDMAN,
Consulting Engineer Newport (Rhode Island) Gas Company, General Manager Gas Department, American Electric Manufacturing Company.

E. M'MILLIN, Esq.,
Vice-President and General Manager Columbus (Ohio) Gas Company, President Western Association of Gas Engineers, Vice-President American Gaslight Association, President Board of Trade, Columbus.

J. P. HARRISON, Esq.,
Treasurer and General Manager Hartford (Connecticut) Gas Company, President New England Association of Gas Engineers.

CROSBIE'S

Economical and Durable.

Paints

Specialty—Red Oxides.

For Gas-Works Use,

AND ALL OUTDOOR IRON AND WOOD WORK.

These Paints are used at a large number of Gas-Works throughout the Kingdom.

ADOLPHE CROSBIE,
Colour Works, WOLVERHAMPTON.

JONAS DRAKE & SON.

—GAS— —ENGINEERS— —CONTRACTORS— —IRONFOUNDERS— —RETORT SETTERS— —ETC.—

Specialities in CARBONIZING PLANT.

GENERATOR AND REGENERATOR FURNACES.

OVENDEN,

HALIFAX (YORKS.)

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERNS COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

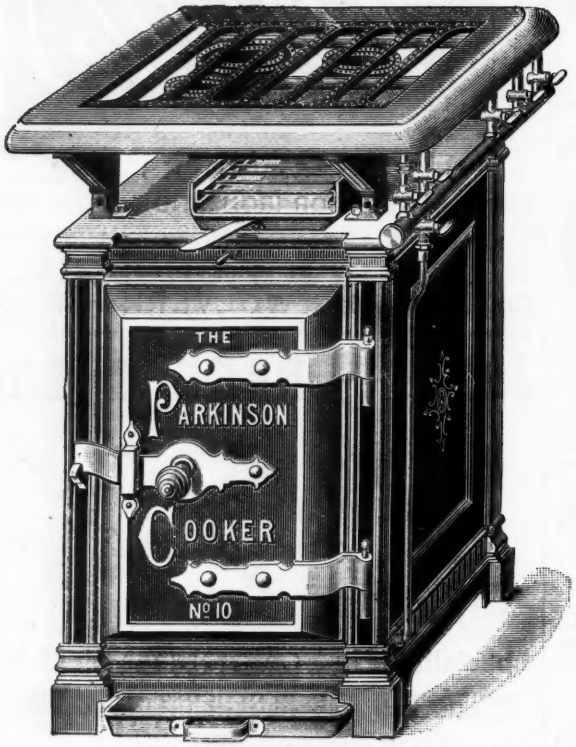
PUTTYLESS STREET LAMP.

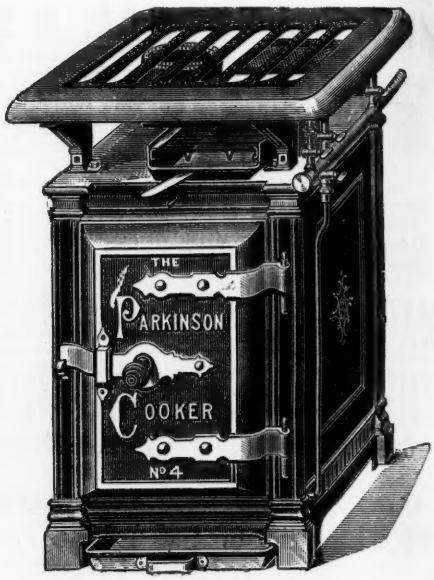
This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

THE "PARKINSON" GAS COOKERS.





Some of the important features and improvements in

THE "PARKINSON" COOKER.

Case of strong cast iron, packed with silicate to retain the heat. Most substantially made and very durable.

Inside lined with enamelled, patent steel plates, which enable the oven to be always kept clean.

Fire-Brick at top, which throws down great heat, and equalizes the temperature of the oven. For cooking Pastry, &c., the heat is perfect.

The Oven is splendidly ventilated, and provided with an efficient damper, which allows the heat to be retained long after the gas is turned off.

Space over Oven is large and free—no impediments to plates and dishes, &c.

New Double Grill, providing **two large square surfaces of great heat,** either of which will cook chops and steaks, &c., or toast bread to perfection. The Grill Burners can be used simultaneously for boiling **without any adaption or alteration.**

Door of Oven shuts immediately if slammed.

"The Cookers have already been adopted by The Gaslight and Coke Company, as well as by many other prominent Companies. Those who have tried the Stoves speak well of their efficiency and economical working; and it may be added that samples which we have seen show that Messrs. Parkinson and Co. are determined to maintain, in this class of goods, the reputation they enjoy for good workmanship and durability."—JOURNAL OF GAS LIGHTING, *May* 19, 1891.

Cannot be excelled for

COMFORT, CONVENIENCE, AND CLEANLINESS.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also Advt., p. 246.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street in the City of London,—Tuesday, August 11, 1891.